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PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room 524
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE
ETATS-UNIS D'AMERIQUE
in its capacity as elected Office

Date of mailing (day/month/year) 26 October 2000 (26.10.00)	
International application No. PCT/EP00/01302	Applicant's or agent's file reference D 1206 PCT
International filing date (day/month/year) 17 February 2000 (17.02.00)	Priority date (day/month/year) 17 February 1999 (17.02.99)
Applicant MOULIN, Michel	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
15 September 2000 (15.09.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer F. Baechler Telephone No.: (41-22) 338.83.38
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For the exposition of thermosensitive printing plates, the machines using a deflection device apply a YAG laser pumped by thermostabilized laser diodes and an acoustic or optical modulator. Besides the high costs, these devices are limited in power and modulation frequency. They do not satisfy the purposes of the present invention.

Summary of the Invention

It is therefore an object of the present invention to provide an improved flat bed platesetter and an improved method for its use. This object is achieved with the features of the claims.

One aspect of the present invention is an improved flat bed platesetter with a method for its use either as an independent unit or within the framework of a complete plate making system with multiple imaging units.

The platesetter as per this invention is more specifically designed for direct production of images obtained by the projection of successive swathes of spots onto the thermosensitive or photosensitive surface of a printing plate. In the flat bed platesetter according to the present invention, a radiant energy emitting head moves transversally to the feed direction of a printing plate sensitive to the radiant energy emanating from the head. The radiant energy may be visible light, infrared, ultraviolet or any other electromagnetic radiation capable of forming a potential image on a printing plate. The optical imaging head includes a spatial modulator illuminated by laser emitters and associated optics capable of forming the image of the modulator on the printing plate surface. It is caused to move crosswise to the direction of the plate motion for the spacing of successive swathes. It is characterized by containing substantially all the electronic and optical components necessary to produce a swath of images on the plate during each back-and-forth excursion. The section of the plate opposite the optical head path is securely maintained in a flat plane preferably by the combined action of rollers located under and above the plate.

The components of the machine are more clearly shown in Fig. 4 representing the imaging zone 10. Beam 20 extending across the machine above the field of precision bearings is provided with rails 120 and 122 on which the head carriage 32 can slide. These rails are located in substantially the same vertical plane, parallel with the face of the optical head. As shown in the Figure, head 32 is located on one side of beam 20. All the wiring connecting the electrical and electronic components of the head assembly with the outside world are channeled through a connector assembly 90 to one end of a flexible conduit 89 located on the other side of beam 20. The other end is attached to a fixed point outside the moving assembly. Together with electrical harness, located preferably in the same conduits, compressed air and cooling fluid are also provided between the moving head 32 and stationary sources.

Lens 39 attached to the carriage 32 moves along line 46 during each travel of carriage 32 over the portion of the plate 28 to be imaged and at an exact distance thereof. The plate is secured in the focus plane by the combined action of bearings such as 48 inserted into plate 24 and pressure bearings 50 as will be explained later in connection with Fig. 9. Each pressure bearing is attached to a pivoted lever 40 urged against the plate bed by spring or gravity. The pressure bearing assembly includes plates 42 and 44, also shown in Fig. 9.

The plate moving carriage will now be described in relation with Figs. 5 and 6. The purpose of this carriage is to move the plate to be imaged by steps from the loading zone 8 through the imaging zone 10 and to the ejection zone 12 where it releases the plate before returning home under the following plate waiting in the loading zone 8. It is characterized by its special construction made of light-weight components and its narrow elongated shape. Referring now to Fig. 5, the body of the carriage is shown at 60 with extension 78. They are preferably made of light honeycomb material encased between carbon fibers plate with aluminum inserts for attaching screws. This construction provides rigidity and low weight, hence minimum inertia forces to overcome for the start and stop operations of the carriage. The mass of the parts to move for swath spacing, including the plate, has been reduced to approximately 4.

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

VOSSIUS & PARTNER
Sieberstrasse 4
D-81675 München
ALLEMAGNE

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing (day/month/year)	20.07.2001
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Applicant's or agent's file reference D 1206 PCT	IMPORTANT NOTIFICATION
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International application No. PCT/EP00/01302	International filing date (day/month/year) 17/02/2000	Priority date (day/month/year) 17/02/1999
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Applicant KODAK POLYCHROME GRAPHICS LTD. et al.
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1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/	Authorized officer
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D-80298 Munich
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Wolinski, A

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REC'D 24 JUL 2001

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

14



Applicant's or agent's file reference D 1206 PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP00/01302	International filing date (day/month/year) 17/02/2000	Priority date (day/month/year) 17/02/1999
International Patent Classification (IPC) or national classification and IPC G03F7/20		
Applicant KODAK POLYCHROME GRAPHICS LTD. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 9 sheets, including this cover sheet.
☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☒ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☒ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 15/09/2000	Date of completion of this report 20.07.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Lohberger, S Telephone No. +49 89 2399 6723 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/01302

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1,2,4-10,12-19 as originally filed

3,3a-3b,11 as received on 08/11/2000 with letter of 08/11/2000

Claims, No.:

1-46 as originally filed

Drawings, sheets:

1/19-19/19 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP00/01302

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
☐ paid additional fees.
☐ paid additional fees under protest.
☒ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
☒ not complied with for the following reasons:
see separate sheet

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☐ all parts.
☒ the parts relating to claims Nos. 1, 2, 4, 5, 7, 8, 46.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims 1, 2, 4, 5, 7, 8, 9-41, 46
	No:	Claims

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP00/01302

Inventive step (IS)	Yes:	Claims	1, 2, 4, 5, 7, 8, 9-41, 46
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1, 2, 4, 5, 7, 8, 9-41, 46
	No:	Claims	

2. Citations and explanations
see separate sheet

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/01302

Re Item IV

Lack of unity of invention

1. The separate inventions/groups of invention are:

- i. Independent claims 1, 2, 4, 5, 7 and 8 (main invention)
- ii. independent claim 3
- iii. independent claim 6
- iv. independent claim 42.

They are not so linked as to form a single general inventive concept (Rule 13.1 PCT) for the following reasons:

group i.) relates to a flat bed plate setter system, wherein the optical head moves across the direction of the movement of the printing plate,

group ii.) relates to a platesetter system, wherein the support means is arranged in a downwardly inclined manner,

group iii.) relates to a platesetter system, wherein the carriage member is provided in a centre position of a support area,

group iv.) relates to a system of flat bed platesetters with feed, exit and branch chains.

2. The Applicant confirmed in his letter from 04.01.2001 that he only wishes to prosecute the application on the basis of the main invention (claims 1, 2, 4, 5, 7 and 8).

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/01302

1. Reference is made to the following document/s/:
D1: US-A-5 934 195 (POWERS JOHN W ET AL) 10 August 1999 (1999-08-10)
D2: WO 96 35144 A (HEDBOM HANS ;MISOMEX AB (SE); TALTS GUSTAV (SE)) 7 November 1996 (1996-11-07)
D3: EP-A-0 558 781 (MICRONIC LASER SYSTEMS AB) 8 September 1993 (1993-09-08)
D4: US-A-4 417 260 (OKAMOTO YOSHIHIKO ET AL) 22 November 1983 (1983-11-22) .
2. D1 is no relevant prior art as long as the priority is validly claimed.
3. D2, especially description page 4, lines 11 to 24, page 6, line 15 to page 8, line 35, figure 5 and claims discloses a flat bed platesetter system.
The principle of movement of the optical head is the same as in present claims of group i.)
There are no drive means for the printing plate over stationary supporting elements.
Vacuum sucking (page 7, lines 9 to 10) corresponds to low inertia elements of claim 1.
The upper carriage (13) with the light house does not correspond to the feature c) of present claim 1, since it is not mounted on a stationary bridge. Therefore claims 1, 2, 4, 5, 7 and 8 fulfil the requirement of article 33(2) PCT with regard to novelty over D2.
4. D3, especially description column 3, line 12 to column 4, line 32, figures and claims discloses a flat bed platesetter system.
A printing plate is moved by a heavy carriage in y-direction. Drive means for moving the printing plate over stationary supporting elements are not present. An optical head not containing the laser light source is moved by a second carriage in x-direction. The carriages are equipped with rails, linear motors, position measurement (laser interferometers) and correction.
Therefore claims 1, 2, 5, 8 to 13 and 39 to 41 fulfil the requirement of article 33(2) PCT with regard to novelty over D3.

5. Neither D2 nor D3 give the skilled man any hint to replace existing features of their platesetters by these novel features set out in claims 1, 2, 4, 5, 7 or 8, which lead to advantages with regard to reduced vibrations, processing speed and precision. Therefore these claims fulfil the requirements of article 33(3) PCT as well.
6. For additional information:
Claim 3 represents a different invention (see unity objection). D4 was initially cited with regard to a feature of claim 3.

D4, especially description column 1, line 15 to column 3, line 53, column 4, lines 48 to 61, figures and claims discloses a flat bed platesetter system similar as proposed in present claims 3, 9 to 13, 15, 16 and 19 and an imaging method similar as proposed in present claim 46. D4 uses feeding belts (6) and (15) with a suction box (15a) and moves the printing plate in one direction. The imaging beam is moved across this direction by the system (10), (12), (13) and (14). **The system (1) to (16) is not mounted in a downwardly inclined manner.** Only the receiver (17) is mounted in a downwardly inclined manner. Locating means for detection of the printing plate position are disclosed as well.

It do not seem to be evident with regard to the positioning of (17) in D4 (downwardly inclined) that a skilled man would arrange the whole platesetter in a downwardly inclined manner since D4 transports the plates by an endless belt and consequently does not need downward inclination.

7. Claims 9-41 as preferred embodiments of independent claims 1, 2, 4, 5, 7 and 8 consequently as well fulfil the requirements of article 33(2) and (3) PCT.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/01302

Re Item VI

Certain documents cited

Certain published documents (Rule 70.10)

Application No Patent No	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
US-A-5 934 195	10.08.1999	13.06.1997	13.06.1997

Re Item VII

Certain defects in the international application

1. D1 to D4 as relevant state of the art are not cited in the introductory part of the description.

Re Item VIII

Certain observations on the international application

1. Present set of claims contains 6 independent "flat bed platesetter system" claims. This cannot be considered to be a concise and clear set of claims. It cannot be seen which are the really essential technical features of the invention.

Article 6 PCT taken in combination with Rule 6.3(b) PCT requires that any independent claim must contain all the technical features essential to the definition of the invention.

2. Page 19 relates to a vague "scope of the invention". The complete paragraph is undefined and as such must be objected under article 6 PCT.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/01302

3. Page 12, line 28 contains a vague reference to an US-application without indication of the number.

REF: EP00101302
05-11-2000 chrome
Lir Ref.: D 1206 PCT

00909197.6 - EP00101302

VOCBUS P DESCAMD
PATENT
SIEBENSTADT
81675 MÜNCHEN

For the exposition of thermosensitive printing plates, the machines using a deflection device apply a YAG laser pumped by thermostabilized laser diodes and an acoustic or optical modulator. Besides the high costs, these devices are limited in power and modulation frequency. They do not satisfy the purposes of the present invention.

The production speed is not important in imaging machines outside the field of the present invention. For example US-A-4 746 942 describes a machine for imaging substrates for the electronic industry where output quality is primordial and speed secondary. According to this document the substrate-supporting table weighs six times more than the printing plate and its moving mechanism of the present invention. This difference that could be translated in terms of productivity precludes the use of this device for the printing industry.

Multibeam devices where each beam is produced by an individually controlled emitter do not show these limitations. However, the number of emitters is limited for economic considerations, for example to 64. To achieve the desired performance, the radiation-sensitive support (printing plate) should move at more than 5 meters/second. This speed can only be obtained with machines where the support must be wrapped around the outside or inside of a drum.

In a flat bed device where a flat printing plate of some rigidity should not be deformed, several hundreds of beams are necessary and the best, if not the only, solution is the use of a spatial modulator as described for example in US-A-4 746 942 (Moulin). In this document the laser and modulation components were at a fixed location remote from the device not to overload the moving optics and adversely affecting the speed of the machine.

The inventor and his team in the years following the filing of the patent referred to above have been able, through innovation and taking advantage of present-day available components, to reduce the size and weight of the multibeam source, so that it can be attached to a fast-moving scanning head.

The power outputted by the head and the number of spots (256) make it possible to conceive a flat bed device operating in a start-stop fashion. In this concept, the support must be moved and stopped accurately and quickly during the direction reversal of the optical head. In order to insure desirable image quality, the distance between the support and the projection lens must be accurate within 50 microns. This result could be obtained by firmly attaching the radiation sensitive support to the accurately flat surface of a table moving in a start-stop fashion. This solution is unacceptable in a machine that should produce printing plates at a high rate (for example for the newspaper industry) for it would take too long for the table to be moved and stabilized because of its inertia.

Summary of the Invention

It is therefore an object of the present invention to provide an improved flat bed platesetter and an improved method for its use. In platesetters, images should be accurately positioned in relation with the edges of the support. The metrology of the exposition system must continuously and accurately know the location of the support in relation to the location of the projected spots. Thus, the support must be accurately positioned when introduced for imaging at a loading station or optical sensors must detect its location. These operations are time consuming. When a plate is being loaded and positioned on the loading section of the machine, a previously loaded plate is being imaged. It is thus another object of the invention to minimize processing time and increase the production rate of a platesetter through an almost continuous flow of plates under the imaging head. These objects are achieved with the features of the claims.

One aspect of the present invention is an improved flat bed platesetter with a method for its use either as an independent unit or within the framework of a complete plate making system with multiple imaging units.

The platesetter as per this invention is more specifically designed for direct production of images obtained by the projection of successive swathes of spots onto the thermosensitive or photosensitive surface of a printing plate. In the flat bed platesetter according to the present invention, a radiant energy emitting head

moves transversally to the feed direction of a printing plate sensitive to the radiant energy emanating from the head. The radiant energy may be visible light, infrared, ultraviolet or any other electromagnetic radiation capable of forming a potential image on a printing plate. The optical imaging head includes a spatial modulator illuminated by laser emitters and associated optics capable of forming the image of the modulator on the printing plate surface. It is caused to move crosswise to the direction of the plate motion for the spacing of successive swathes. It is characterized by containing substantially all the electronic and optical components necessary to produce a swath of images on the plate during each back-and-forth excursion. The section of the plate opposite the optical head path is securely maintained in a flat plane preferably by the combined action of rollers located under and above the plate.

The components of the machine are more clearly shown in Fig. 4 representing the imaging zone 10. Beam 20 extending across the machine above the field of precision bearings is provided with rails 120 and 122 on which the head carriage 32 can slide. These rails are located in substantially the same vertical plane, parallel with the face of the optical head. As shown in the Figure, head 32 is located on one side of beam 20. All the wiring connecting the electrical and electronic components of the head assembly with the outside world are channeled through a connector assembly 90 to one end of a flexible conduit 89 located on the other side of beam 20. The other end is attached to a fixed point outside the moving assembly. Together with electrical harness, located preferably in the same conduits, compressed air and cooling fluid are also provided between the moving head 32 and stationary sources.

Lens 39 attached to the carriage 32 moves along line 46 during each travel of carriage 32 over the portion of the plate 28 to be imaged and at an exact distance thereof. The plate is secured in the focus plane by the combined action of bearings such as 48 inserted into plate 24 and pressure bearings 50 as will be explained later in connection with Fig. 9. Each pressure bearing is attached to a pivoted lever 40 urged against the plate bed by spring or gravity. The pressure bearing assembly includes plates 42 and 44, also shown in Fig. 9.

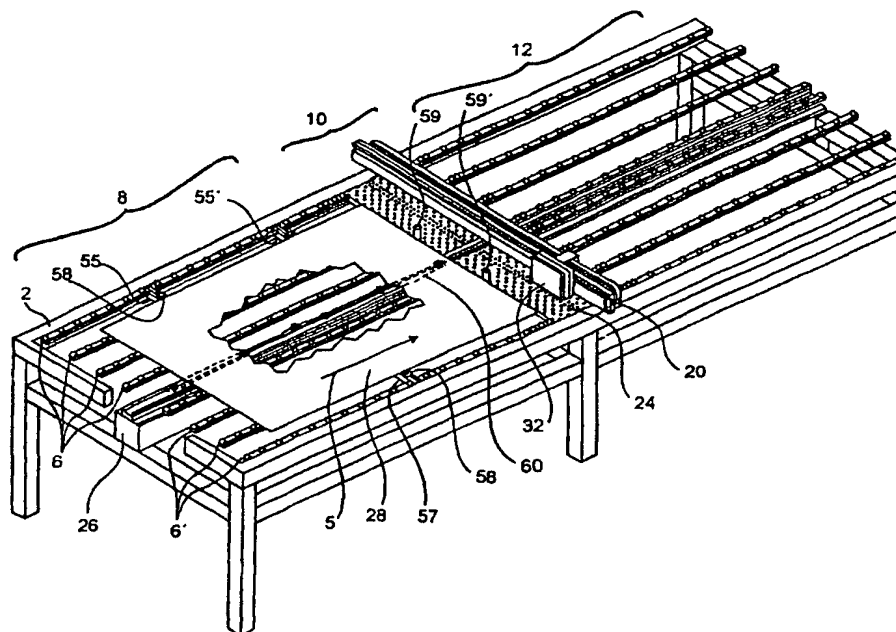
The plate moving carriage will now be described in relation with Figs. 5 and 6. The purpose of this carriage is to move the plate to be imaged by steps from the loading zone 8 through the imaging zone 10 and to the ejection zone 12 where it releases the plate before returning home under the following plate waiting in the loading zone 8. It is characterized by its special construction made of light-weight components and its narrow elongated shape. Referring now to Fig. 5, the body of the carriage is shown at 60 with extension 78. They are preferably made of light honeycomb material encased between carbon fibers plate with aluminum inserts for attaching screws. This construction provides rigidity and low weight, hence minimum inertia forces to overcome for the start and stop operations of the carriage. The mass of the parts to move for swath spacing, including the plate, has been reduced to approximately 4 kg.



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : G03F 7/20, H04N 1/12	A1	(11) International Publication Number: WO 00/49463 (43) International Publication Date: 24 August 2000 (24.08.00)												
<p>(21) International Application Number: PCT/EP00/01302</p> <p>(22) International Filing Date: 17 February 2000 (17.02.00)</p> <p>(30) Priority Data:</p> <table border="0"> <tr> <td>99103116.2</td> <td>17 February 1999 (17.02.99)</td> <td>EP</td> </tr> <tr> <td>99104944.6</td> <td>12 March 1999 (12.03.99)</td> <td>EP</td> </tr> <tr> <td>99105135.0</td> <td>26 March 1999 (26.03.99)</td> <td>EP</td> </tr> <tr> <td>99112797.8</td> <td>2 July 1999 (02.07.99)</td> <td>EP</td> </tr> </table> <p>(71) Applicant (for all designated States except US): KODAK POLYCHROME GRAPHICS COMPANY LTD. [US/US]; 401 Merritt 7, Norwalk, CT 06851 (US).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): MOULIN, Michel [CH/CH]; Rue d'En Haut 16, CH-1143 Apples (CH).</p> <p>(74) Agent: VOSSIUS & PARTNER; Siebertstrasse 4, D-81675 München (DE).</p>		99103116.2	17 February 1999 (17.02.99)	EP	99104944.6	12 March 1999 (12.03.99)	EP	99105135.0	26 March 1999 (26.03.99)	EP	99112797.8	2 July 1999 (02.07.99)	EP	<p>(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DE (Utility model), DK, DK (Utility model), EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</p>
99103116.2	17 February 1999 (17.02.99)	EP												
99104944.6	12 March 1999 (12.03.99)	EP												
99105135.0	26 March 1999 (26.03.99)	EP												
99112797.8	2 July 1999 (02.07.99)	EP												

(54) Title: FLAT BED PLATESETTER SYSTEM



(57) Abstract

The present invention provides a flat bed platesetter system and a method for its use, particularly for imaging printing plates. For providing a precise, continuous, rapid and format-independent system which is reliable, the present invention suggests to move the printing plate relative to a stationary bridge carrying a radiant energy emitting head by means of a low inertia carriage member effectively connecting the printing plate and drive means.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

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Flat Bed Platesetter System

Field of the Invention

The present invention relates in general to the imaging of offset printing plates and more particularly to a multibeam system and method for imaging modulated beams of radiant energy on a flat printing plate.

Background of the Invention

Machines presently used for the production of printing plates by exposing their sensitized surface to light or heat rays generally produced by laser rays are commonly known as platesetters. In these machines a flexible plate is wrapped around the outside or inside of a drum. Devices of this kind require delicate and time consuming operations for introducing, forming and straightening plates as illustrated in US-A-5 699 740.

Among other machines avoiding the use of a drum, a photocomposer has been constructed as described in US-A-4 746 942 under the title of "Photocomposing Machine and Method" by same inventor. This machine is more appropriate for film imaging than for printing plates of some rigidity such as metal plates. It includes a laser at a fixed location remote from the plate, necessitating complex optical means that limit the size of the imaging area. In addition, the driving of the photosensitive material by pinch rollers located at a certain distance from the imaging head has the general problems associated with the use of pinch rollers for wide material. It is difficult to adjust and does not insure accurate displacement of both margins of the film and exact repeatability.

Another flat bed scanner described in US-A-4 764 815 involves the use of a complex pneumatic double-platen system to carry and step the media to be scanned. The reciprocating head mechanism includes inertia operated springs, and a complex and expensive hard to control acousto-optic deflector unit located at a fixed position with mirror means to transfer light beams to the reciprocating head with no focussing means for imaging.

Among flat bed machines, there are also photoplotters based on the use of interlaced light emitting diodes located on an imaging head above a photosensitive plate fixed to a heavy table. In these machines, a considerable mass must be moved and the illumination they provide is not adequate for the sensitivity of metal plates and for high production rates.

Another device based on essentially the same configuration of a projection head moving in two perpendicular directions over a fixed plate is described in GB-A-2 299 728 (Neilson et al.). This particular device scans a light beam across the surface of a photosensitive plate attached to a bed. It comprises a bridge that extends across the bed from one side to the other, supported at each end by independent carriages movable along rails located on the side of the bed perpendicular to the bridge. A scanning head can move along guides extending the length of the bridge. Drive means and position location means are located at each end of the bridge and control means monitor the operation of each drive means in accordance with position information. The device is located above a storage for plates and means are provided for selecting plates of the desired size and feeding them upwards and to a layer of air at a location defined by stops.

Other flat bed devices use a laser beam deviated by a rotating mirror associated with a continuously moving film or plate. The scanning length of these deflection devices is limited. The use of several adjacent deflection systems could be utilized to extend the scanning range but at the cost of expensive and difficult beam junction means.

For the exposition of thermosensitive printing plates, the machines using a deflection device apply a YAG laser pumped by thermostabilized laser diodes and an acoustic or optical modulator. Besides the high costs, these devices are limited in power and modulation frequency. They do not satisfy the purposes of the present invention.

Summary of the Invention

It is therefore an object of the present invention to provide an improved flat bed platesetter and an improved method for its use. This object is achieved with the features of the claims.

One aspect of the present invention is an improved flat bed platesetter with a method for its use either as an independent unit or within the framework of a complete plate making system with multiple imaging units.

The platesetter as per this invention is more specifically designed for direct production of images obtained by the projection of successive swathes of spots onto the thermosensitive or photosensitive surface of a printing plate. In the flat bed platesetter according to the present invention, a radiant energy emitting head moves transversally to the feed direction of a printing plate sensitive to the radiant energy emanating from the head. The radiant energy may be visible light, infrared, ultraviolet or any other electromagnetic radiation capable of forming a potential image on a printing plate. The optical imaging head includes a spatial modulator illuminated by laser emitters and associated optics capable of forming the image of the modulator on the printing plate surface. It is caused to move crosswise to the direction of the plate motion for the spacing of successive swathes. It is characterized by containing substantially all the electronic and optical components necessary to produce a swath of images on the plate during each back-and-forth excursion. The section of the plate opposite the optical head path is securely maintained in a flat plane preferably by the combined action of rollers located under and above the plate.

The images consist of columns of spots whose intensities are individually controlled by a modulator. The printing plate is slidably movable over a low friction bed by vacuum grippers attached to a low-inertia sliding carriage member, thereafter also referred to as "plate mover slide". The grippers, preferably integral with the sliding carriage, hold the plate securely during its passage through the imaging zone to accurately space adjacent swaths.

According to a feature of the invention, the printing plate, regardless of its size is automatically squared against collapsible stops in the support area before being gripped by the vacuum grippers of the plate mover slide.

According to a feature of a first embodiment of the invention, the plate to be imaged is also automatically centered between the edges of the loading area by the combined action of lateral pins.

According to a feature of a second embodiment of the invention, the centering of the image between the edges of the plate is obtained by electronic means.

The plate handling system as per the present invention is partially characterized by the combination of a low-friction stationary support bed in which the plate rests during its travel through the machine and a relatively narrow plate mover unit is located under the plate. The primary function of the bed is to hold the plate flat and of the plate mover to slide it over the bed.

In a preferred embodiment the bed is a field of rollers or ball bearings and the plate mover is a light elongated drive carriage with a line of gripper suction cups. It is located under the plate in a substantially central area of the support field, except for a narrow protruding section rising to the plate level. The plate slides in unison with the drive carriage when the vacuum suction cups are energized in order to space successive swaths until the plate has been completely exposed. Then, the suction cups are de-energized and the carriage is returned to its initial position to pick up the

following plate that has been sitting against stops located at the end of an inclined plane.

The bed includes a section below the path of the shuttling optical head provided with a field of very accurate bearings against which the plate is firmly maintained in the focal plane by a group of bearings urged against the plate by springs or by gravity.

The flat bed platesetter system and the method for its use according to the present invention have in particular the advantages that they combine simplicity, reliability, rapidity and precision. This precision in particular allows the exact imaging of four printing plates to be used in four-color printing machines.

These features are obtained by the use of few movable elements of low inertia to obtain great accuracy and high productivity. For example, a plate of 1.5 by 2 meters can be accurately stepped 5 millimeters in 80 milliseconds following the imaging of a swath with an accuracy of the order of 2 microns, sufficient to avoid banding. The non-productive time between the imaging of two successive plates can be reduced to a few seconds. The incident radiant energy reaching the plate can be over 20 watts for certain applications such as the imaging of thermosensitive offset printing plates of large format.

One characteristic of the present invention is the use of two light-weight carriages moving alternatively along paths at right angles and in timed relation to image a printing plate of any format and rigidity. Each carriage is driven by a high-efficiency linear motor whose motion is controlled by special circuits to avoid or minimize the effects of inertia.

According yet to another feature of the invention, plates fed to the machine are delivered on a field of ball or roller bearings. The field may be sufficiently inclined to let the plate slide by gravity to squaring stops until picked up by the plate mover carriage returned home at the end of the imaging of the previous plate.

According to another characteristic of the invention, the imaging head is provided with substantially all the electronic and optical components necessary to produce and project a swath of images on the plate. During the imaging sections of its excursions at a constant speed, the plate is securely maintained in place by the grippers of the plate-mover carriage.

The invention concerns also a new set-up for the serial production of printing plates in which a plate handling system is associated with a number of stand-alone platesetters.

Other objects, features and advantages of the invention will be apparent from the following detailed description when read in conjunction with the accompanying drawings that show by way of illustration, and not limitation, preferred embodiments of the invention.

Brief Description of the Drawings

FIG. 1 is a schematically represented overall view of the flat bed platesetter according to the present invention.

FIG. 1-A is a schematic view of part of the plate bed of the machine.

FIG. 2 represents an overall view of the flat bed platesetter according to the present invention seen from the plate input side.

FIG. 2-A represents another view of the flat bed platesetter seen from the plate output side.

FIG. 3 represents schematically a mechanism to accurately square a plate on the machine bed.

FIG. 3-A is a more detailed view of the plate positioning mechanism.

FIG. 4 represents a section of the bed at the imaging zone showing the optical head seen from the front and rows of pressure rollers.

FIG. 5 is an isometric view of the plate mover carriage seen from one side.

FIG. 6 is an isometric view of the plate mover carriage seen from the other side.

FIG. 7 is an end view of the plate mover carriage.

FIG. 7-A is a partial cross section of Fig. 7.

FIG. 8 represents the optical head assembly as seen from the output side of the machine.

FIG. 8-A represents a linear motor of the type used to drive the head assembly.

FIG. 8-B represents a bracket connecting the head to its linear motor.

FIG. 9 is an end view of the optical head with a partial cross section.

FIG. 10 represents the face of the optical head as seen from the input side.

FIG. 10-A is another side view of the optical head with the plate edge photoelectric detector.

FIG. 11 is a block diagram of the electrical electronic and computerized controls of the platesetter and its connection with the outside world.

FIGS. 12 to 17 represent schematically the travel through the system of successive plates. In each of these Figs., suffix **A** represents a side view and suffix **B** the corresponding plan view.

FIG. 18 is a schematic representation of a multiple plate handling system incorporating two independent platesetter units.

Description

The assembly shown in Fig. 1 schematically represents the machine and its most important components. To facilitate the description it can be divided into three zones: a loading zone 8, an imaging zone 10 and an ejection zone 12. These three zones include a bed of ball or linear bearings on which printing plates can ride. The bed of zones 8 and 12 may include standard bearings 18 supported by commercially available channels 14 as shown in Fig. 1-A. The supporting bed of imaging zone 10 preferably includes high precision bearings represented as dots in Fig. 1. Printing plates can be manually introduced to the loading zone 8 or automatically fed as will be described later in connection with Fig. 18. The loading zone may comprise positioning means to accurately position plate 28. The positioning means may

comprise positioning elements 55, 55' and 57 at each lateral side of the loading area 8 and stop elements 59 and 59' at its downstream end, close to the junction of the loading and imaging zones. The lateral positioning elements 55, 55' and 57 are preferably movable in a direction transverse to the direction of movement 5 of the printing plate 28. The stop elements 59 and 59' are preferably movable up and down in a vertical direction. When they are positioned on the path of the plate they stop its sliding motion, until they receive a signal from the machine control to clear the passage as will be described later to let the plate proceed to the imaging area 10.

The plate may be centered in the transverse direction over the supporting bed by mechanical means. This may be obtained by the combined action of one positioning element 57 at one lateral side of the plate bed and two positioning elements 55 and 55' spaced apart from each other at the opposite lateral side. This configuration ensures a proper and defined position of the plate on the support area. Elements 55, 55' and 57 can be sliding bars provided at their end with small wheels or rollers 58 contacting the respective edges of the plate to be centered on the loading zone 8, and on the track followed by the plate moving carriage. By a known centering mechanism not shown, e.g., a pneumatic mechanism, elements 55 and 55' on one side and element 57 on the other side are simultaneously and resiliently moved toward the plate until it is centered.

To position the image area at equidistance between the edges of the plate, the exact mechanical centering of the plate may be replaced by electronic means as will be explained later.

The plate support area 24 encompassing the imaging zone 10 is made of precision bearings represented by dots in Fig. 1 instead of conventional linear bearings 18 located in other plate supporting areas, as will be shown more clearly in relation with Fig. 4. The beam supporting the plate-mover carriage is shown at 26. The reciprocating optical head 32 is shown on one of its rails 20. It travels over the plate

maintained in the image plane with a precision of, e.g., ± 50 microns by the combined action of precision bearings and pressure bearings (Fig. 4).

Fig. 2 represents more clearly and with more details the machine viewed from the input side. The head carriage rails, located in substantially the same vertical plane are shown at 120 and 122. The fixed part of the head carriage linear motor is shown at 30. The relatively narrow area over which moves the imaging head is shown at 36 with a plate 29 located in this area. Rail 6", similar to the other rails, globally shown at 6, can be moved up slightly to clear the passage for the plate mover returning home as will be explained later in relation with Fig. 3-A. The elongated gap or valley 34 between rows of ball-bearings rails 6, shown void in the Figure, is the area reserved for the passage of the plate mover carriage not shown in this Figure. The platesetter table assembly is supported by heavy vertical supports 4 resting on the floor. The table is also supported by a number of vertical members 16 attached to a frame 2. This Figure also shows the general aspect of the optical head: a vertical, box-like unit 32, from which protrudes a lens 39 and a photodetector unit 52. The purpose of the latter, in one embodiment of the invention, is to define and set up the active imaging run of the head on the plate and to set up the controls to place images at its center.

Fig. 2-A is similar to Fig. 2, representing the table assembly as seen from the output side of the machine. In addition to the elements shown in the preceding Figure, the elongated beam supporting the rails on which the plate mover carriage slides is shown at 26. At a right angle with, i.e., perpendicular to this beam and above the plate area is located another beam or bridge 20 supported by legs 22. The plate supporting area of the table located in the imaging zone is represented by two units 24 and 24' separated by a gap provided for the passage of the plate handler. They are provided with precision ball or roller bearings 48.

The plate squaring system is schematically illustrated in Figs. 3 and 3-A.

It is preferably supported by a bridge 111 located above the table area, parallel with the beam supporting the optical head and in the vicinity of the junction between the loading and imaging zones as shown in phantom lines in Fig. 2-A. Fig. 3 shows a plate 103 sitting on bed 105 of the loading zone 8 waiting to be pushed forward by a mechanism 101. This mechanism resiliently pushes the plate against squaring pins 59 and 59', respectively operated up and down by mechanisms located in box 100 and 100' to move corresponding pins below and above the plate tract. Before a plate is delivered to the loading zone, stop pins 59 and 59' represented by reference number 102 in Fig. 3-A are pushed down by appropriate pneumatic actuators represented at 100 and 100'. When a plate such as 103 is moved to the loading zone, for example, by sliding over an inclined support as shown in Fig. 12-B, it continues down the loading area until it is stopped by pins 59 and 59'. These pins are accurately located on a plane parallel with the optical head track and substantially perpendicular to the edge of the plate. When the plate 103 arrives in the vicinity of the pins 102, it is resiliently pinched between a block 112 and a wheel 108 mounted on a lever 106, pivoted at 107 and urged against the plate by a spring 104. Block 112 is attached to a small carriage 114 adapted to oscillate back and forth by the action of pneumatic means not shown. This procedure insures a firm sitting of plate 103 against the squaring stops 59 and 59' without the use of undue force.

Fig. 3-A also shows a pneumatically operated jack 110. Its purpose is to slightly lift the end of rail 6" (shown in Figs. 2 and 2-A) to clear the way for the passage of the suction cups located at the top of the plate drive carriage when it returns home. This allows the suction pads of the carriage to easily slide under a plate in the "waiting" position. At the completion of the squaring procedure, and the return of rail 6" to its normal position, the vacuum grippers of the plate carriage are energized to firmly engage the plate. Then, the squaring components 100, 114 are de-energized and the pinching wheel is moved up away from the plate, now under the exclusive control of carriage 60 (Fig.5).

The components of the machine are more clearly shown in Fig. 4 representing the imaging zone 10. Beam 20 extending across the machine above the field of precision bearings is provided with rails 120 and 122 on which the head carriage 32 can slide. These rails are located in substantially the same vertical plane, parallel with the face of the optical head. As shown in the Figure, head 32 is located on one side of beam 20. All the wiring connecting the electrical and electronic components of the head assembly with the outside world are channeled through a connector assembly 90 to one end of a flexible conduit 89 located on the other side of beam 20. The other end is attached to a fixed point outside the moving assembly. Together with electrical harness, located preferably in the same conduits, compressed air and cooling fluid are also provided between the moving head 32 and stationary sources.

Lens 39 attached to the carriage 32 moves along line 46 during each travel of carriage 32 over the portion of the plate 28 to be imaged and at an exact distance thereof. The plate is secured in the focus plane by the combined action of bearings such as 48 inserted into plate 24 and pressure bearings 50 as will be explained later in connection with Fig. 9. Each pressure bearing is attached to a pivoted lever 40 urged against the plate bed by spring or gravity. The pressure bearing assembly includes plates 42 and 44, also shown in Fig. 9.

The plate moving carriage will now be described in relation with Figs. 5 and 6. The purpose of this carriage is to move the plate to be imaged by steps from the loading zone 8 through the imaging zone 10 and to the ejection zone 12 where it releases the plate before returning home under the following plate waiting in the loading zone 8. It is characterized by its special construction made of light-weight components and its narrow elongated shape. Referring now to Fig. 5, the body of the carriage is shown at 60 with extension 78. They are preferably made of light honeycomb material encased between carbon fibers plate with aluminum inserts for attaching screws. This construction provides rigidity and low weight, hence minimum inertia forces to overcome for the start and stop operations of the carriage. The mass of the parts to move for swath spacing, including the plate, has been reduced to approximately 4.

The carriage is provided with two grooved wheels 74 supported by brackets 75 on one side and a roller 76 supported by bracket 77 on the other side, respectively, sitting on rails 64 and 64' attached to beam 26. For driving the carriage together with the printing plate an electric linear motor can be utilized. It may be of the type LEB-S-2-S available from Anorad, U.S.A. Its fixed part attached to beam 26 is shown at 70 and its mobile part attached to the sliding carriage is shown at 72, at or near its center of gravity. The combination of a light carriage of special construction and an appropriate linear motor makes it possible to move the carriage and the plate for swath spacing (5.12 mm) in less than 80 milliseconds, including the stabilization time, with an accuracy of 2 microns.

Three vacuum cups are located on the top surface of the carriage body, shown at 66-1, 66-2 and 66-3 with air ducts 82. Each cup is made up of a soft rim and a harder core against which the plate is pulled. In order to place them vertically at the exact level of the focus plane, each suction cup unit is attached to a plate 67 mounted on the carriage body, secured and adjusted by screws 68. For large printing plates all suction cups are energized. For smaller plates, only two cups are energized. The number of cups to activate can be done by programming or electronically by a photo detector system as explained below. A photodetector device is shown at 94, supported by bracket 95. Its purpose is to make sure that there is no preceding plate sitting on the ejection zone 12 waiting to be moved to the processing area. Another photodetector 92 attached near the rear end of the body of the carriage is supported by bracket 93 to determine the presence or absence of a plate when the carriage is returned to its home position and to selectively energize the vacuum cups as explained above. Box 80, attached to the top of the unit by a bracket 81, contains photoelectric means to measure the intensity distribution of the radiation emanating from the optical head. Its purpose is to make it possible to adjust the intensity of pixel groups as explained in co-pending U.S. application [SN***] entitled "Pixel Intensity Control in Electro-Optic Modulators". For defining the exact position of the carriage along its path of movement, an encoder system 88 is provided. The encoder system, for example, may be an inductive or capacitive measurement system. One type

suitable for the purpose of the present invention may comprise a read head RGH22F and a self-adhesive scale RGS-S available from Renishaw UK. Thus, by means of the encoding system 88, the actual position of the moving carriage as required by a controller (not shown) at any time can be achieved by the combination of the linear motor and the encoder 88.

In a manner similar to the arrangement described above in connection with Fig. 4, all the wiring connecting the electrical and electronic components of the plate carriage assembly with the outside world are channeled by two connectors. Connector 86 transfers the information to the end of a first flexible cable (not shown) attached to support bracket 84. Bracket 84' similarly supports the end of a second cable. Thus, these two brackets support the moving side of the wiring cables. The fixed ends of the carriage cables, if fixedly attached to plate 85, are protected by plate 85'.

Fig. 6 shows another view of the plate carriage assembly. In this Figure, the fixed part of the linear motor controlling the carriage motion is shown at 70 and the mobile part attached to the carriage at 72. It is attached to an extension 78 by screws 78'. Reference numbers 91 and 91' represent shields covering the wiring cables connecting the carriage to a fixed part of the machine. Fig. 7 is an end view of the carriage assembly. In addition to the components described in connection with Figs. 5 and 6, this Figure shows more clearly the two parts of the linear motor of the carriage. The mobile part 72 of the motor is mounted on extension 78 and its fixed part, attached to beam 26 is shown at 70. The encoder located between the carriage and its fixed support is shown at 88. Box 89 schematically represents the shield of the flexible wiring connection. The moving ends of the wiring connection is attached to plate 84 and the fixed part to plate 85 as is also shown in the preceding Figures. The plate carriage slides between rows of bearings 18 in the loading and ejection zones and precision bearings 48, represented more clearly in the cross section of Fig. 7-A. In this Figure, a plate supporting the accurate bearings is shown at 24 and the cover through which the outside periphery of the bearings slightly emerge at 25.

The optical head carriage will now be described in connection with Figs. 8 to 10-A. Fig. 8 represents the head carriage as seen from the back side, that is the side opposite to the side shown in Fig. 4. It is in the form of a relatively flat box containing substantially all the components mentioned above in connection with the description of Fig. 4. The head carriage is provided with two grooved wheels 124 and a roller 126 located in a bracket 127. It can slide along rails 120 and 122 attached to beam 20, substantially located in the same vertical plane, by the action of a linear motor of the type shown in Fig. 8-A. This motor comprises movable parts 137 and 138 and a fixed elongated part 142. The latter has two wings 147 and 148 between which movable part 138 moves when appropriate electrical energy is fed to its coils. As shown in Fig. 8, movable parts 137 and 138 of the linear motor are firmly attached to the body 32 of the head by a bracket 139 and the fixed channel-like part of the motor is secured to a stationary support. The purpose of bracket 139 is to place moving part 138 between the two stationary legs 142 of the motor. The moving parts of the motor are firmly attached to bracket 139 between two ears 146 and screws not shown. Bracket 139 in turn is also attached to the head by screws 135 so that head 32 and the movable parts of the motor move in unison. According to a preferred embodiment of the invention the carriage head may be attached to its driving component at a point at or near its center of gravity and substantially at the center of its supporting vertical rails. The head can move at a constant speed of, e.g., 1.2 m/s for the projection of a swath. Its special construction, made of light but rigid material makes it possible to minimize the effects of inertia. Although the head carries all the components necessary to project images, the deceleration and reversal time has been reduced to about 60 milliseconds, approximately equal to the time taken by the plate to be moved from one swath to the next one. This permits a high production rate.

The electrical wiring to the linear motor 137 is located in a conduit 130 attached to the head by clips 131. This wiring as well as all the other wiring connecting the moving head to its base are channeled through connectors 132. Compressed air is channeled through piping 128 to nozzle 152 to blow air under lens 39. Terminals for the high energy required by the motor are shown at 153 and 154. Connectors 155

and 156 represent the input and output of a cooling fluid which may be necessary by the high power laser diode located inside the head enclosure.

The moving part of the encoder of the head assembly detecting the precise location of the head along its rails is shown at 140. Small magnets shown at 136 in this Figure are mounted on, preferably cemented against the body of the head as shown in Fig. 9. Their purpose is to maintain the head firmly against the roller 126 supported by bracket 127 (see also Fig. 9).

A side view of the optical head assembly is shown in Fig. 9 together the central area of the imaging zone 10. In this Figure, the same components as shown in the preceding Figures are designated by the same reference numbers. Thus, the carriage supporting beam attached to the frame of the machine is shown at 20 and its rails at 120 and 122. The moving part of the coder is shown at 140, supported by bracket 141. The moving parts of the linear motor are shown at 137 and 138 and the fixed part at 142.

The bottom part of Fig. 9 completes Fig. 4 representing the imaging zone 10 of the machine and the two Figures should be considered closely related. Head 32 moves above the central zone of the imaging zone 10, substantially along line 46. As can be seen in Fig. 9 the pressure rollers such as 50 and 50' are slightly offset from opposite supporting bearings 40 and 40' in order to slightly urge the area of the plate comprised between rows 50 and 50' against central bearing rows located along line 46. It has been experimentally found that this is an excellent arrangement enabling the distance between the lens and the plate to be kept within a predetermined range, e.g., ± 50 microns.

Fig. 10 schematically represents an alternative method used for centering the images on a plate. In this Figure, the head 32' is provided with a box 150 supported by brackets 151. This box includes photoelectric means to detect the edges of the plate as the head moves transversally along line 9. This approach makes it possible to

program the starting and finishing points of the head travels, and to center images on the plate. Fig. 10-A represents the outline of the head equipped with detection unit 150 supported by bracket 151.

Fig. 11 is a simplified block diagram of the platesetter system as per the invention. All the elements within the limits of box 160 are part of the platesetter unit as described above. All the elements of box 162 are included in the travelling head of the machine, also called imaging or printing head. As mentioned as a characteristic of a preferred embodiment of the invention, it includes all what is necessary to project images, in particular a laser unit 163, a light modulator 164, a plate edge detector 165, the moving part 168 of a linear motor and an encoder 166. Wiring or ducts globally shown at 169 connect the moving head to stationary supplies or controllers. Box 170 represents the components of the plate mover unit. In addition to vacuum grippers, it includes the moving part of a linear motor 174, a light intensity measuring cell 176 and an encoder 172 co-operating with fixed scale 173. The elements of box 170 are connected to stationary sources via connectors 175. These sources include the laser supply 179, the travelling head interface 178 and two-axe controller 180. Other electronic controls of the platesetter are represented at 182 and 183. The CPU 181 controls the operation of the machine. Data on the location of the head along its rails and its speed are transferred to block 178 by encoder 166. Information concerning the state and displacement of the plate-mover are transferred to block 170 by encoder 172. All these controls insure the safe and efficient travels of the head and of the plate-mover. They insure the best performance achievable also rendered possible by the fact that the time taken by the head at the end of one scan for deceleration, reversal and acceleration is approximately the same as the time taken by the plate mover to move one step, including stabilisation time.

The imaging method according to the present invention will now be illustrated with reference to FIGs. 12-A to 17-B in which the travel of a plate will be described. In each of these Figures, the section referenced A represents a side view and section referenced B a top view. FIG. 12 represents the platesetter at rest. As explained

above, it comprises a loading zone 8, a printing or imaging zone 10 and an ejection zone 12. In the Figure, the vacuum grippers are not energized and the carriage is at its home position. Fig. 12 also shows a supply zone 7 into which plates are fed either manually or automatically. A plate to be imaged can be moved toward the loading zone 8 by pivoting hinged wing 158 of the table or otherwise if an automatic plate handling system is associated with the platesetter. Fig. 12, represents the machine waiting for the first plate. In this Figure, positioning elements 55, 55' and 57 are in their rest position, away from the area to be occupied by the plate. This "rest" position can be adjusted if desired to accommodate plates of different formats. The first plate 116 is waiting in the supply zone 7, prevented from sliding further by pins 53. When the system is ready to handle the first plate, pins 53 are moved out of the way so that plate 116 can slide down to loading area 8. It now sits against elements or pins 59, 59' while centering pins 55, 55' and 57 move toward the center of area 8 to center the plate. Upon a "go" signal received from the controller, the centering pins are moved away as indicated by arrows in Fig. 13-B. Plate 116, now attached to the plate moving carriage after energization of the suction cups is allowed to move through the imaging area 10, as illustrated in this Fig. 13-B. In the meantime, following plate 117 which was waiting in the supply area is allowed to move down, as shown in Fig. 14-B, where it is waiting for the centering operation to take place while plate 116 is reaching the end of the imaging stage. At the completion of this stage, plate 116 is released from the grippers of carriage 60 and left in the evacuation or ejection zone 12 from which it will be manually or automatically removed while carriage 60 returns home, ready to pick up the following plate 117. The same sequence as above will be repeated for this plate 117 while the following plate 118 is waiting in the supply zone, and the process can continue for succeeding plates.

Fig. 18 represents a system comprising two platesetters served by a common plate-handling unit. It consists mainly of feed chain A, exit chain D and a number of branch chains B and C located between A and D, each serving separate platesetter units 232-1, 232-2, 232-n. Captors 208, 208', 208" and stop pins 210, 210', 210" are located at strategic points along the chains. They may be located on chain A, at the

intersections of this chain with chains B and C. They are associated with pushers 216 and 216' whose purpose is to transfer plates from chain A to branch chains B or C. Thus, they may be located at the entrance to platesetter systems 232-1 and 232-2 located on branch chains B and C. They are associated with sensors for the purpose of detecting the presence of a plate. Their purpose is to control the up and down motion of stop pins. These stop pins square up and maintain a plate in position until they are pulled back upon receipt of a "signal to proceed" sent by one or another imaging unit.

As shown in the drawing, in the first platesetting unit 232-1, plate 224, just emerging from the imaging zone of the unit, is still under the dependence of the plate drive carriage. It is on its way to processor 226 while the following plate 222, having reached the inclined ball bearing zone 8, is sliding down toward pins 59 against which it will be maintained while pins 53 and 57 move toward each other to center the plate. In the meantime, in the second platesetting unit 232-2, plate 228 is moved to processor 226' after imaging has been completed, thus allowing this unit to receive following the plate 220. This plate, momentarily maintained by the pins of unit 232-2, will be released as soon as it has been picked up by the returned plate carriage to be carried to the imaging zone of unit 232-2. The following plate 218 stopped by pins 53 at the entrance of the inclined table of section 7, will be released and allowed to enter the inclined zone as soon as retaining pins 53 receive a signal signifying the end of the imaging stage of preceding plate 220. In the meantime, plate 214 previously removed from loader 202 and freed from interleaf paper by stripper 204 has moved to section 206 of chain A. It moves down over the rollers of chain A after it has been released by retaining pins. It will continue its motion down chain A and to be directed to the next available platemaking unit.

The process continues with following plates as they are released one by one from loader 202 at the command of the general control of the system. They queue toward platesetting units and then to plate processors attached to each unit and finally, over rollers 230 of chain D, to bender 233 and stocker 234.

While the invention has been described with reference to its preferred embodiments, it will be understood by those skilled in the art that various changes may be made without departing from the scope of the invention.

C L A I M S

1. A flat bed platesetter system (1) for imaging radiant energy onto a printing plate (28), the system comprising:
 - (a) drive means (60) for moving the printing plate (28) in a direction of movement (28) over stationary supporting elements (6);
 - (b) at least one low inertia element (66) effectively connecting the printing plate (28) and the drive means (60); and
 - (c) an optical head (32) being movably mounted on a stationary bridge (20) extending across the direction of movement (5) of the printing plate (28) and being provided for emitting radiant energy onto the printing plate (28).
2. A flat bed platesetter system (1) for imaging radiant energy onto a printing plate (28), the system comprising:
 - (a) an optical head (32) being movably mounted on a stationary bridge (20) extending across a direction of movement (5) of the printing plate (28); and
 - (b) a radiant energy emitting source (39) being provided at or in the optical head (32) for emitting radiant energy onto the printing plate (28).
3. A flat bed platesetter system (1) for imaging radiant energy onto a printing plate (28), the system comprising:
 - (a) drive means (60) for moving the printing plate (28) in a direction of movement (5);
 - (b) support means supporting the flat bed platesetter system (1) in a downwardly inclined manner with respect to the direction of movement (5) of the printing plate (28); and
 - (c) optionally a storing and delivery system for a plurality of printing plates (28) having a support and delivery area which is downwardly inclined or inclinable in order to feed a printing plate (28) by means of the gravitational force onto a support area (8) of the flat bed platesetter.

4. A flat bed platesetter system (1) for imaging radiant energy onto a printing plate (28), the system comprising:
 - (a) drive means (60) for moving the printing plate (28) in a direction of movement (5);
 - (b) an optical head (32) being movably mounted on a stationary bridge (20) extending across the direction of movement (5) of the printing plate (28) and being provided for emitting radiant energy onto the printing plate (28); and
 - (c) printing plate positioning means for bringing the printing plate (28) into a defined and precisely centred position onto a support area prior to imaging, wherein a first positioning element (57) is provided at a first lateral side, second and third positioning elements (55, 55') are provided at the opposite second lateral side, and at least a fourth positioning element (59, 59') is provided at a downstream end of the support area (8).
5. A flat bed platesetter system (1) for imaging radiant energy onto a printing plate (28), the system comprising:
 - (a) a support area (8) movably supporting the printing plate (28) in a direction of movement (5);
 - (b) an optical head (32) being movably mounted on a stationary bridge (20) extending across the direction of movement (5) of the printing plate (28) and being provided for emitting radiant energy onto the printing plate (28); and
 - (c) a drive assembly effectively connecting the printing plate (28) and drive means (60), the drive assembly including:
 - a carriage member (66) carrying the printing plate (28) and being optionally mounted on at least one bearing (64, 74);
 - an electric linear motor (70, 72) driving the carriage member (66); and
 - an encoding system (88) for properly defining the position of the carriage member (60) along its path of movement (5).

6. A flat bed platesetter system (1) for imaging radiant energy onto a printing plate (28), the system comprising:
 - (a) drive means (60) for moving the printing plate (28) in a direction of movement (5); and
 - (b) a carriage member (66) effectively connecting the printing plate (28) and the drive means (60), wherein the carriage member (60) is provided in a centre position of a support area (8) supporting the printing plate (28).
7. A flat bed platesetter system (1) for imaging radiant energy on a printing plate (28), the system comprising:
 - (a) an optical head (32) being movably mounted on a stationary bridge (20) extending across a direction of movement (5) of the printing plate (28); and
 - (b) drive means (60) for moving the printing plate (28) in said direction of movement (5), wherein said drive means (60) is provided with at least one radiation intensity detector (80) and/or at least one detector (92, 94) at its tail end and/or its front end.
8. A flat bed platesetter system (1) for imaging radiant energy on a printing plate (28), the system comprising:
 - (a) an optical head (32) being movably mounted on a stationary bridge (20) extending across a direction of movement (5) of said printing plate (28), wherein substantially all electronic, optical, electrical and mechanical components of said optical head (132) are located in a closed box-like container made of rigid and light material, and wherein emerging from said box-like container a lens (39), an edge detector (150), roller bearings (124), a moving part (137, 138) of a linear motor, an encoder (140) and connectors (153 to 156) are provided all on one side of at least one supporting rail (120) and all connecting conduits are provided on the other

side of said container to balance the weight of the optical head (32) properly.

9. A flat bed platesetter system (1) according to a combination of any of claims 1 to 8.
10. The system of any of claims 1 to 9, further comprising bearing means (18, 18') for movably supporting the printing plate (28) in the direction of movement (5).
11. The system of any of claims 1 to 10, wherein the printing plate (28) comprises a thermosensitive or photosensitive material.
12. The system of any of claims 1 to 11, wherein the head (32) comprises a spatial modulator being illuminated by at least one laser emitter and an optic forming the image of the modulator onto the printing plate level.
13. The system of claim 12, wherein the head (32) comprises the laser emitters.
14. The system of any of claims 1 to 13, wherein the drive means (60) is a carriage including the longitudinally moving element (72) of a linear motor (70).
15. The system of any of claims 1 to 14, wherein the drive means (60) is supportingly guided by at least one element (74).
16. The system of any of claims 1 to 15, wherein the carriage comprises at least one vacuum gripper (66) holding the printing plate (28).
17. The system of any of claims 1 to 16, wherein the carriage member (60) is located in the middle of the width of the flat bed.

18. The system of any of claims 1 to 17, being arranged inclined in the direction of movement (5) of the printing plate (28).
19. The system of any of claims 1 to 18, further comprising printing plate positioning means (55, 57, 59) for bringing the printing plate (28) into a defined and precisely centred position prior to imaging.
20. The system of claim 19, wherein the printing plate positioning means comprise at least one positioning element (55, 57) provided respectively laterally of a support area (8) and at least one positioning element (59) provided at an downstream end of the support area (8).
21. The system of claim 20, wherein a first positioning element (57) is provided at a first lateral side, second and third positioning elements (55, 55') are provided at the other, second lateral side, and a fourth positioning element (59) is provided at the downstream end of the support area (8).
22. The system of claim 20 or 21, wherein at least one of the positioning elements (55, 57, 59) is movable.
23. The system of any of claims 1 to 22, further comprising an encoding system (88) for properly defining the position of the carriage member (66) along its path of movement (5).
24. The system of any of claims 1 to 23, further comprising printing plate squaring means (59, 59') to position plate (28) at a defined longitudinal position (103) prior to imaging.
25. The system of claim 24, in which the squaring means comprises two movable elements (59, 59').

26. The system of claim 24 or 25, in which the plate is firmly abutted against the positioning elements (59, 59') by friction pushing mechanism (101).
27. The system of any of claims 1 to 26, in which low-friction elements (18, 48) are arranged to form a supporting surface extending the length of the platesetter (1).
28. The system of claim 27, wherein the supporting surface is divided into three longitudinal supporting zones in the direction of movement (5): a loading zone (8) to receive plates to be imaged, an imaging zone (10) where plates are subjected to radiant energy and an ejection zone (12) to receive the imaged plates.
29. The system of claim 28, wherein the loading zone (8) comprises arrays of parallel, longitudinally aligned roller-bearing channels (6, 6', 6'') to receive and support plates (28).
30. The system of claim 29, in which said array is disposed on each side of the path (34) of the drive means (60).
31. The system of claim 29 or 30, in which one (6'') of the roller-bearing channels (6, 6') is movable (110).
32. The system of any of claims 28 to 31, in which the supporting zone (10) includes rows of precision bearings (48) inserted in solid plates (24, 24').
33. The system of claim 32, in which rows of pressure bearings (36) maintain the plate (28) against rows of precision bearings (48).

34. The system of claim 33, wherein the pressure bearings (50, 50') are offset in relation with corresponding precision bearings (48, 48') to firmly maintain the plate (41) in the focal plane of the imaging lens (39).
35. A system of any of claims 1 to 34, wherein the drive means (60) is provided with a radiation intensity detector (80).
36. The system of any of claims 1 to 35, wherein the drive means (60) is provided with a detector (94) at its front end to detect the presence of a plate located too close on its track.
37. The system of any of claims 1 to 36, wherein the drive means (60) comprises a detector (92) at its tail end to detect the presence of a plate too close on its return trip home.
38. The system of any of claims 1 to 37, wherein the drive means (60) has a base (78) located under the supporting bed with sliding elements (74, 76) and a protruding section carrying suction cups (66) at the level of the supporting plate area.
39. The system of any of claims 1 to 38, wherein substantially all electronic, optical, electrical and mechanical components of the optical head (32) are located in and/or at a closed box-like container made of rigid and light material.
40. The system of claim 39, wherein a lens (39), an edge detector (52), roller bearings (124), a moving part (137, 138) of a linear motor, an encoder (140) and connectors (132, 153 to 156) are emerging from this box all on one side of at least one supporting rail (120), while all connecting conduits are on the other side to balance the weight of the optical head (32) properly.

41. The system of claim 40, wherein the optical head (32) is attached to the linear motor at its center of gravity.
42. A system for imaging radiant energy onto a printing plate, the system comprising:
 - a) at least two flat bed platesetter systems;
 - b) a transport assembly including a feed chain (A), an exit chain (D) and at least two branch chains (B, C) located between the feed chain (A) and the exit chain (D), wherein each of the flat bed platesetter systems is located in one of the branch chains (B, C).
43. The system of claim 42, wherein the flat bed platesetter systems are flat bed platesetter systems according to any of claims 1 to 41.
44. The system of claim 42 or 43, wherein the branch chains (B, C) comprise different types and/or numbers of flat bed platesetter systems.
45. The system of any of claims 42 to 44, wherein the transport assembly further comprises at least one loader (202), stripper (204), plate processor (226, 226'), bender (233) and/or stocker (234).
46. Method for imaging a printing plate (28) with radiant energy in a flat bed platesetter, particularly according to a system of any of claims 1 to 45, comprising the steps of:
 - (a) providing a printing plate (28) on a support area (8) of the flat bed platesetter;
 - (b) positioning the printing plate (28) on the support area (8);
 - (c) moving the printing plate (28) in a first direction (5); and
 - (d) moving a radiant energy emitting head (32) in a second direction substantially perpendicular to the first direction (5) in order to provide an image on the printing plate (28).

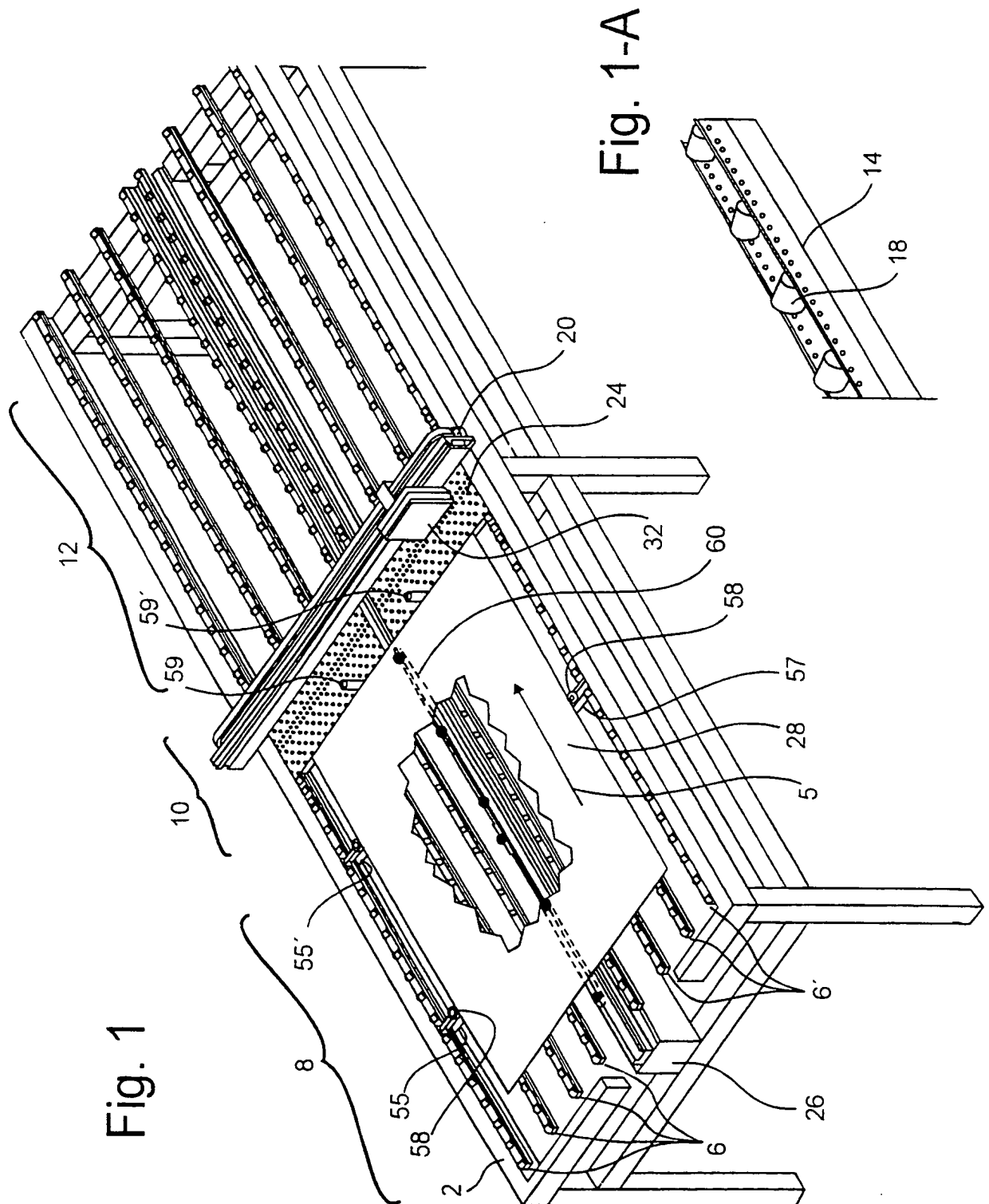
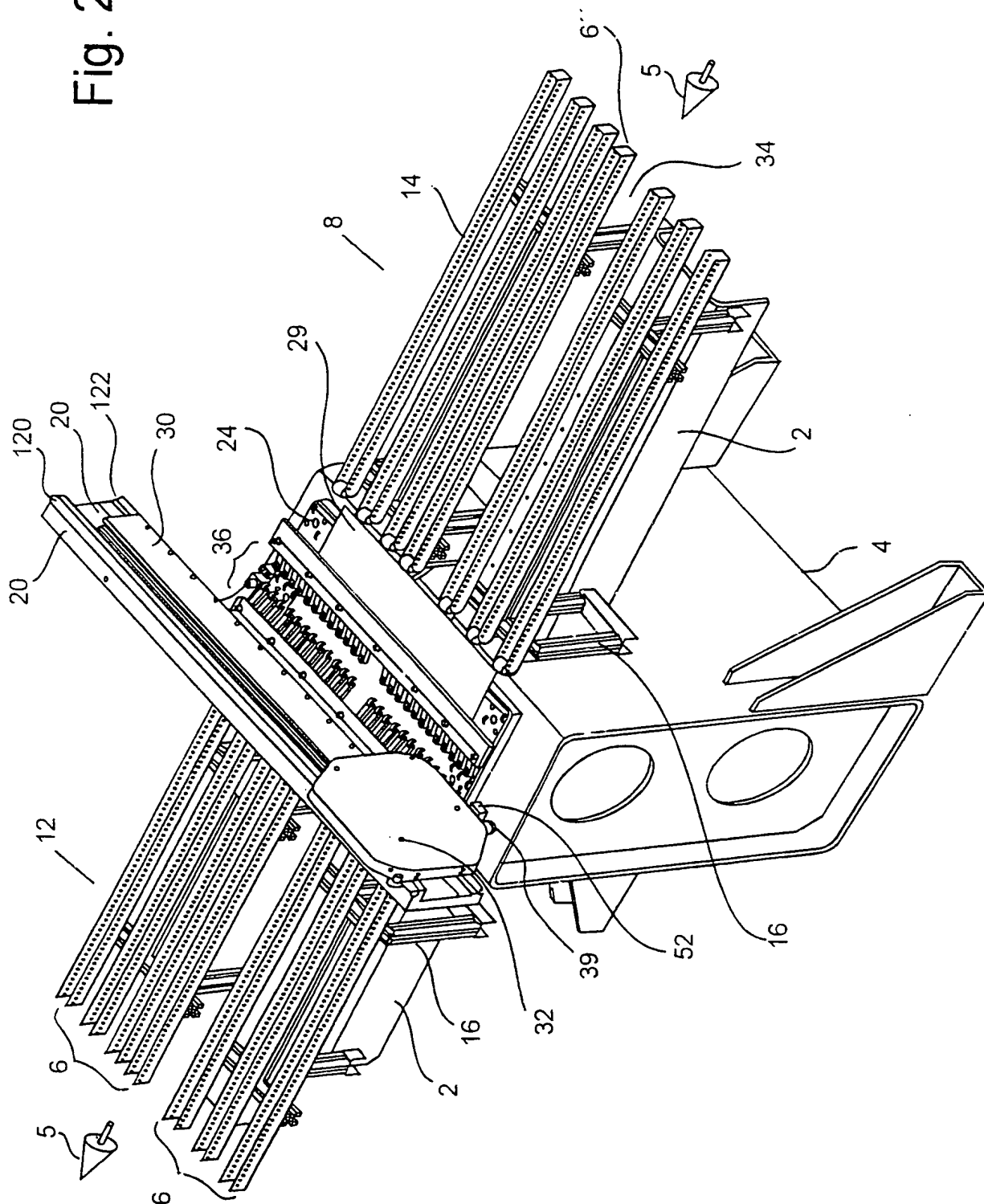


Fig. 2



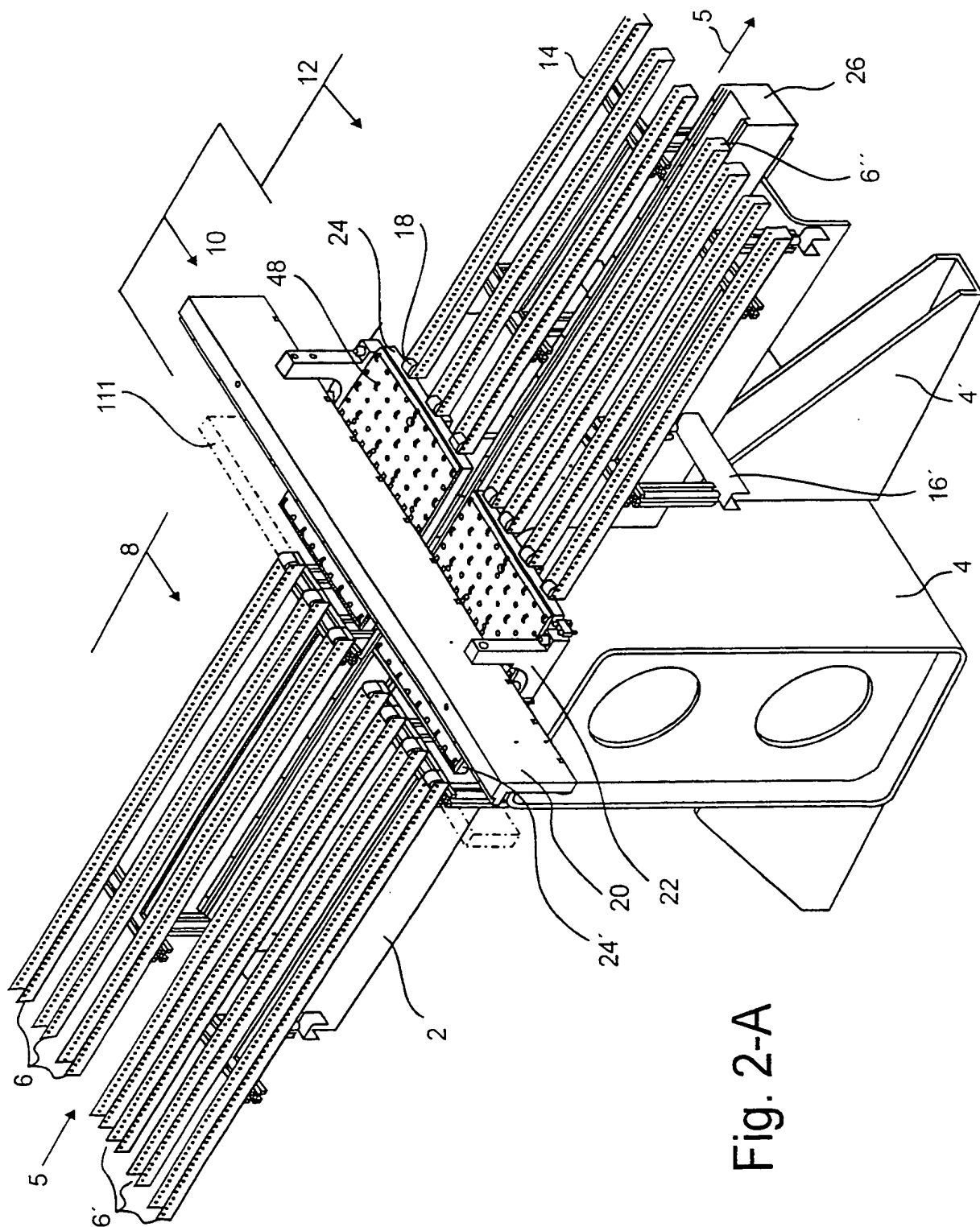


Fig. 2-A

Fig. 3

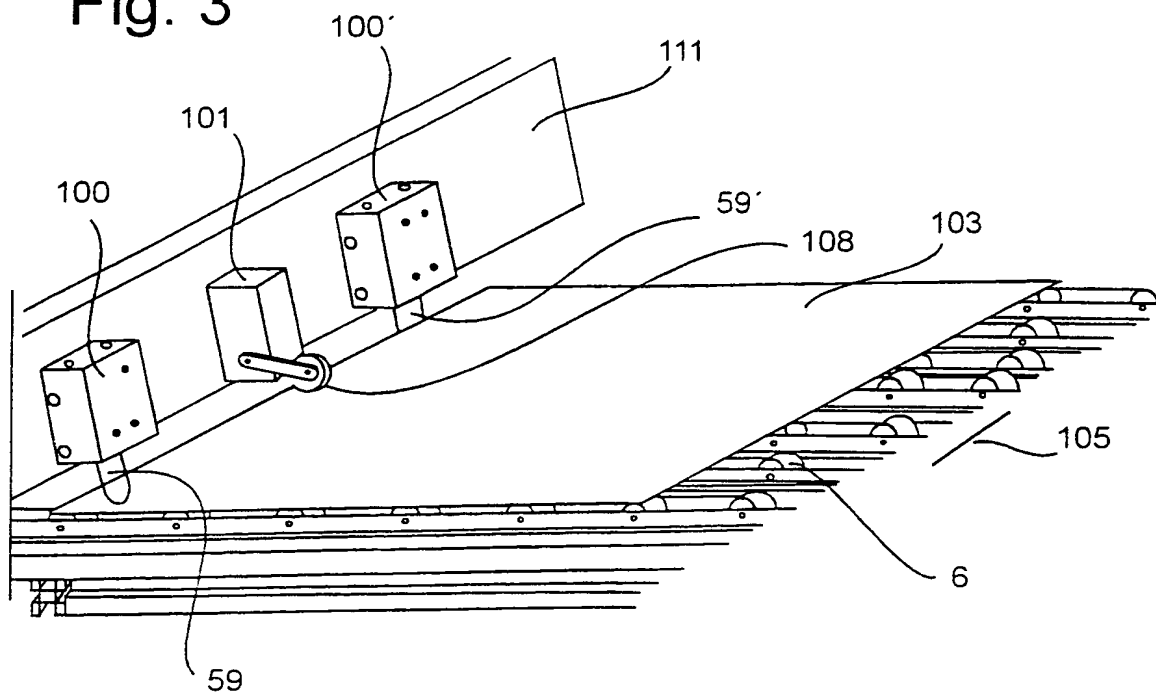


Fig. 3-A

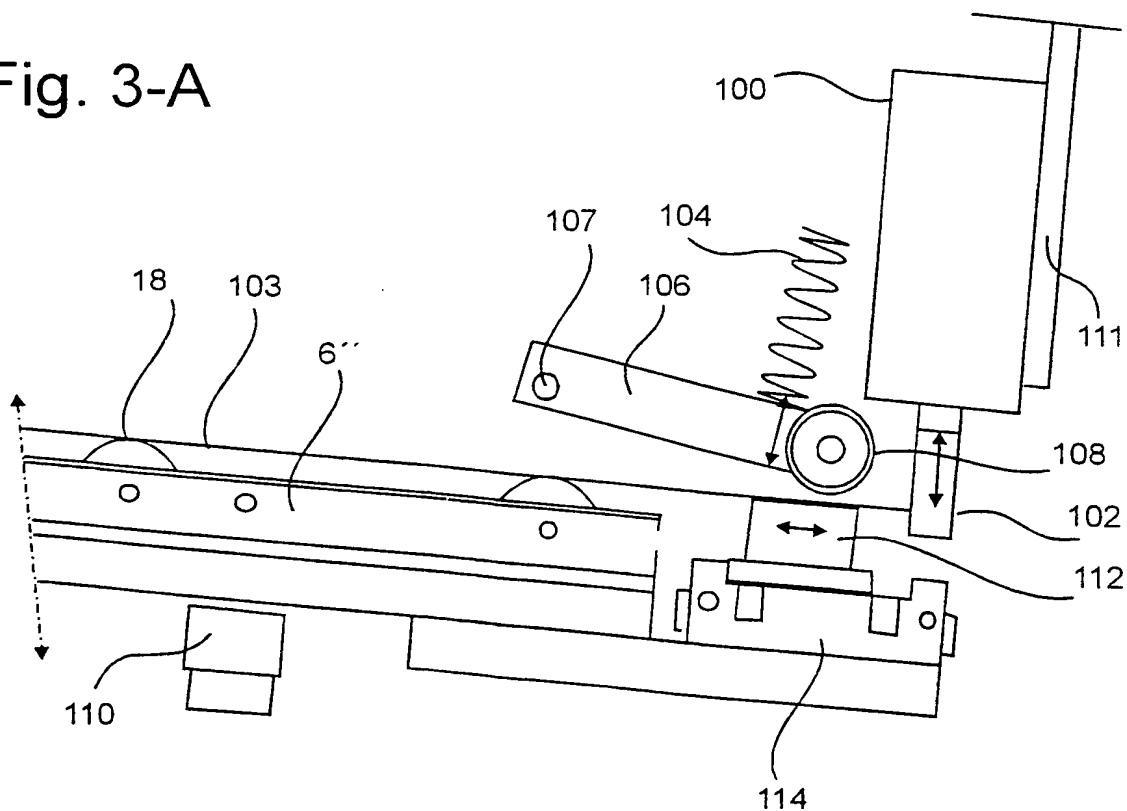


Fig. 4

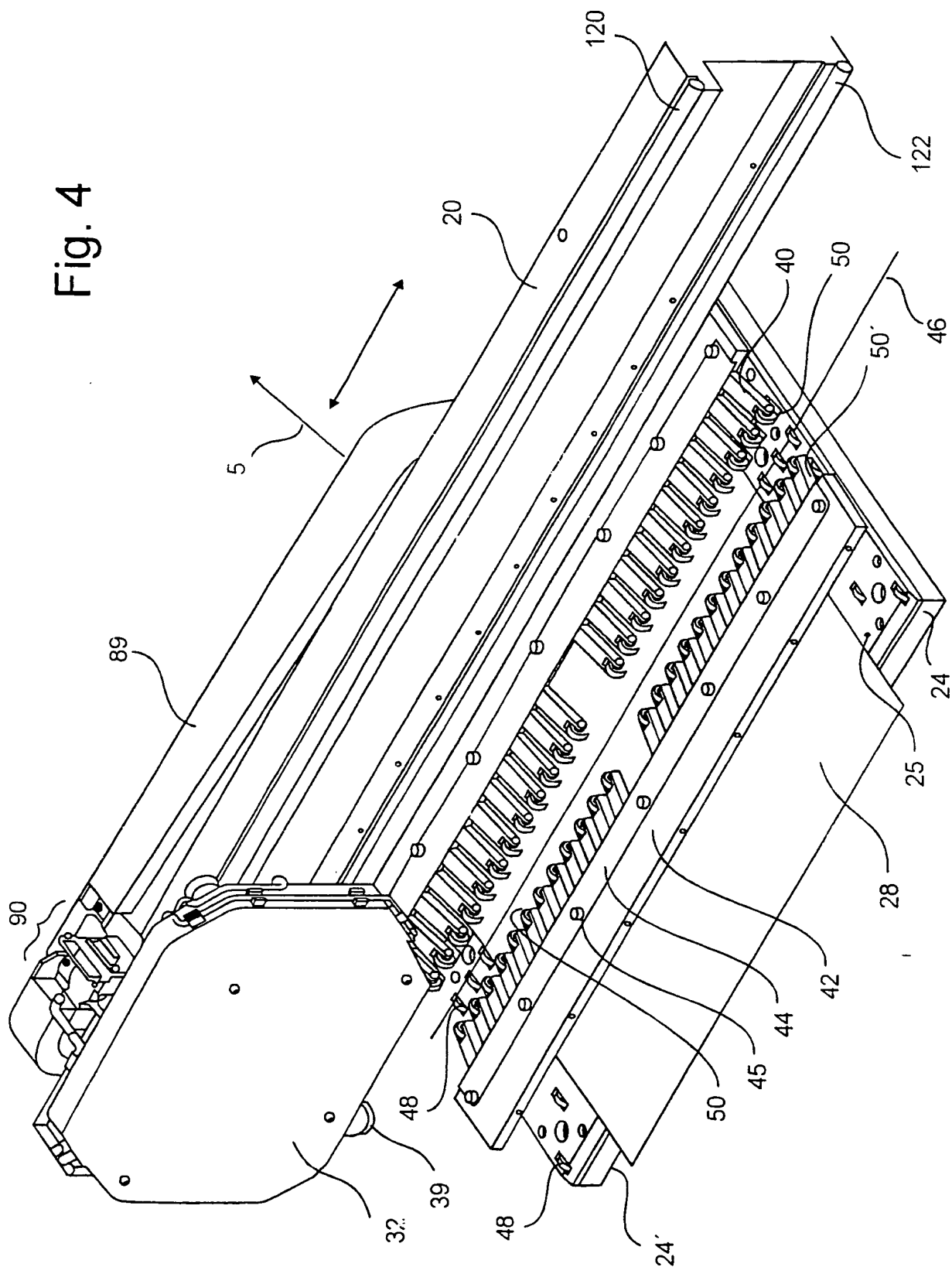


Fig. 5

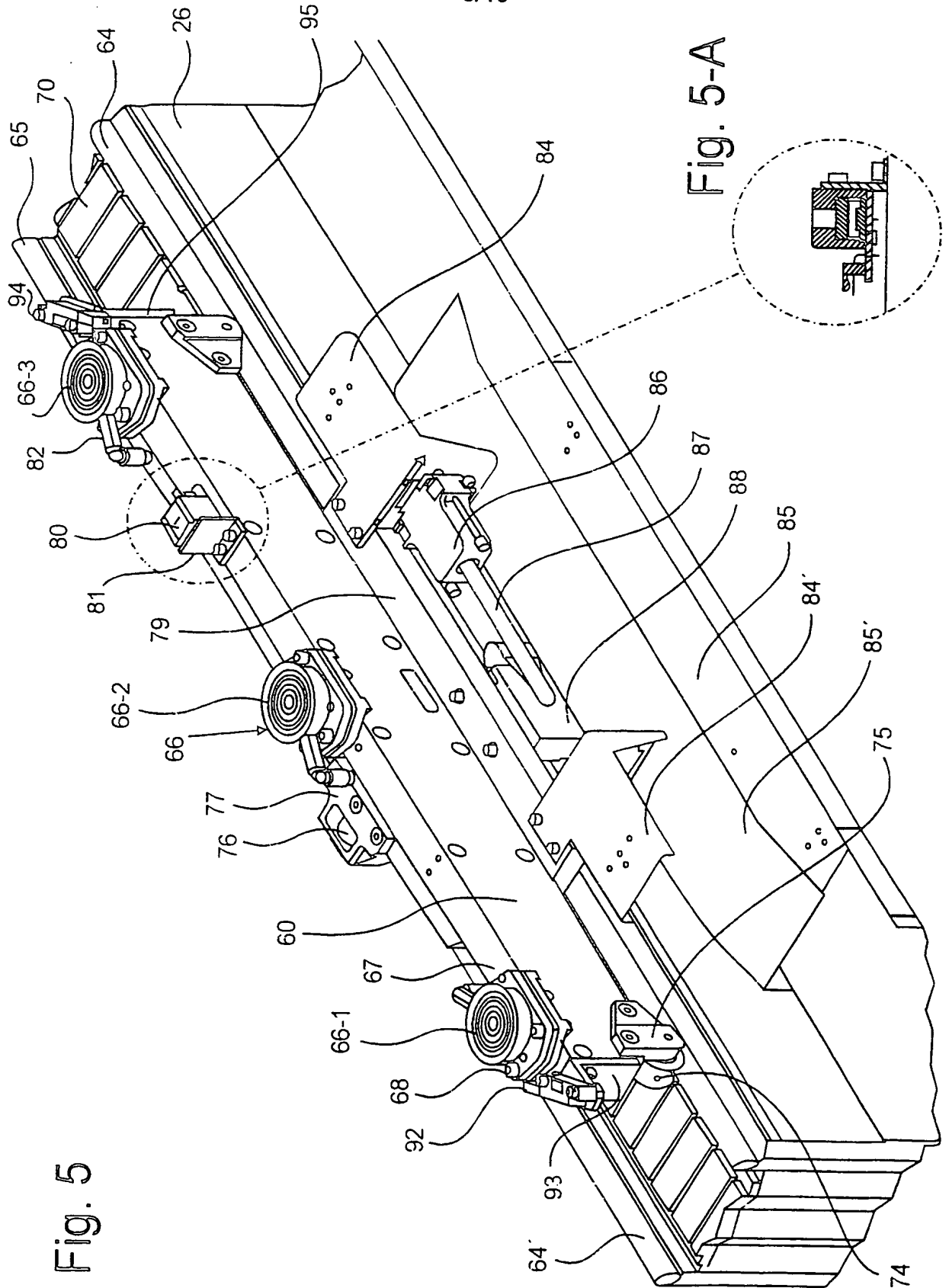
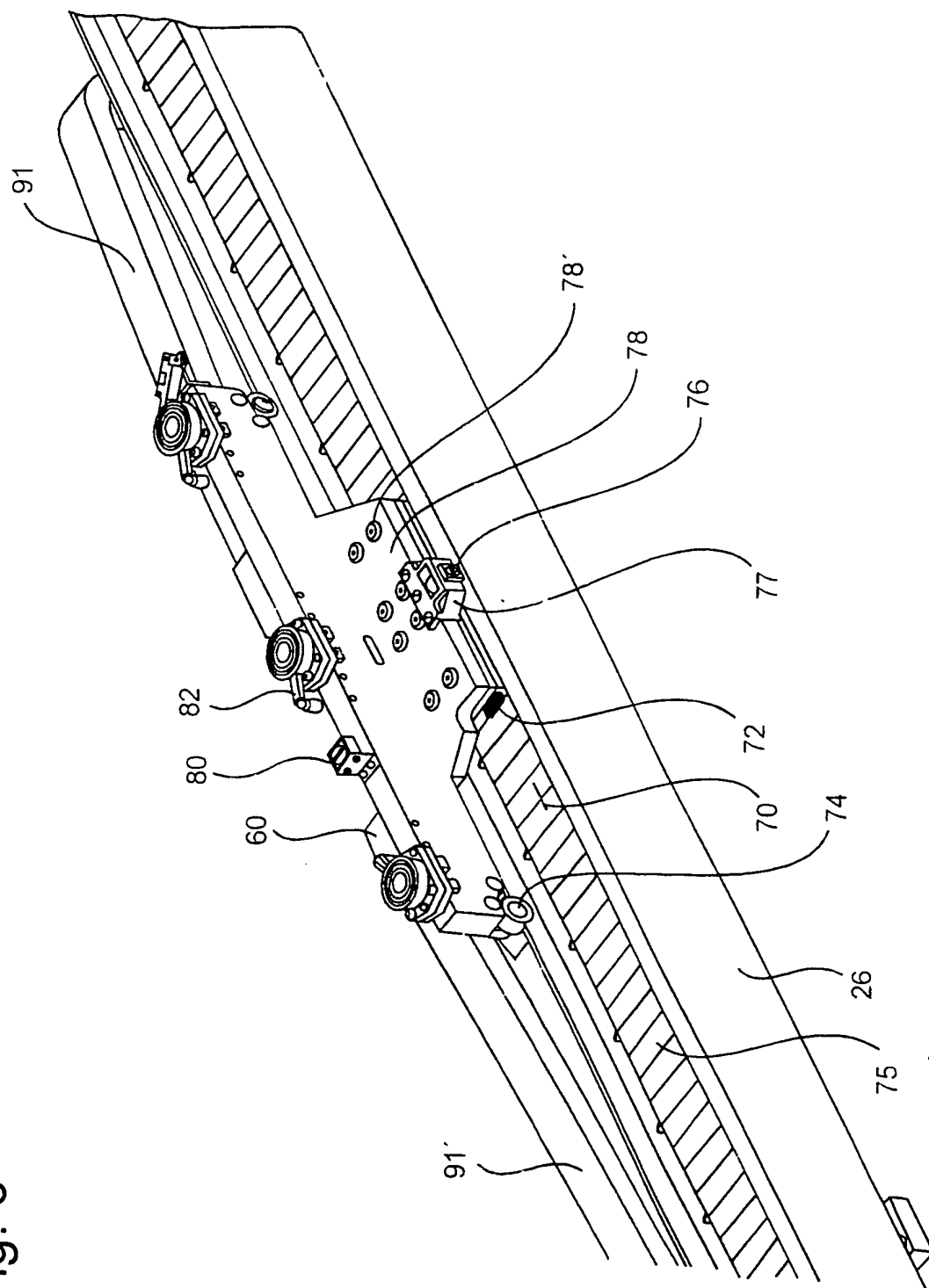


Fig. 5-A

Fig. 6



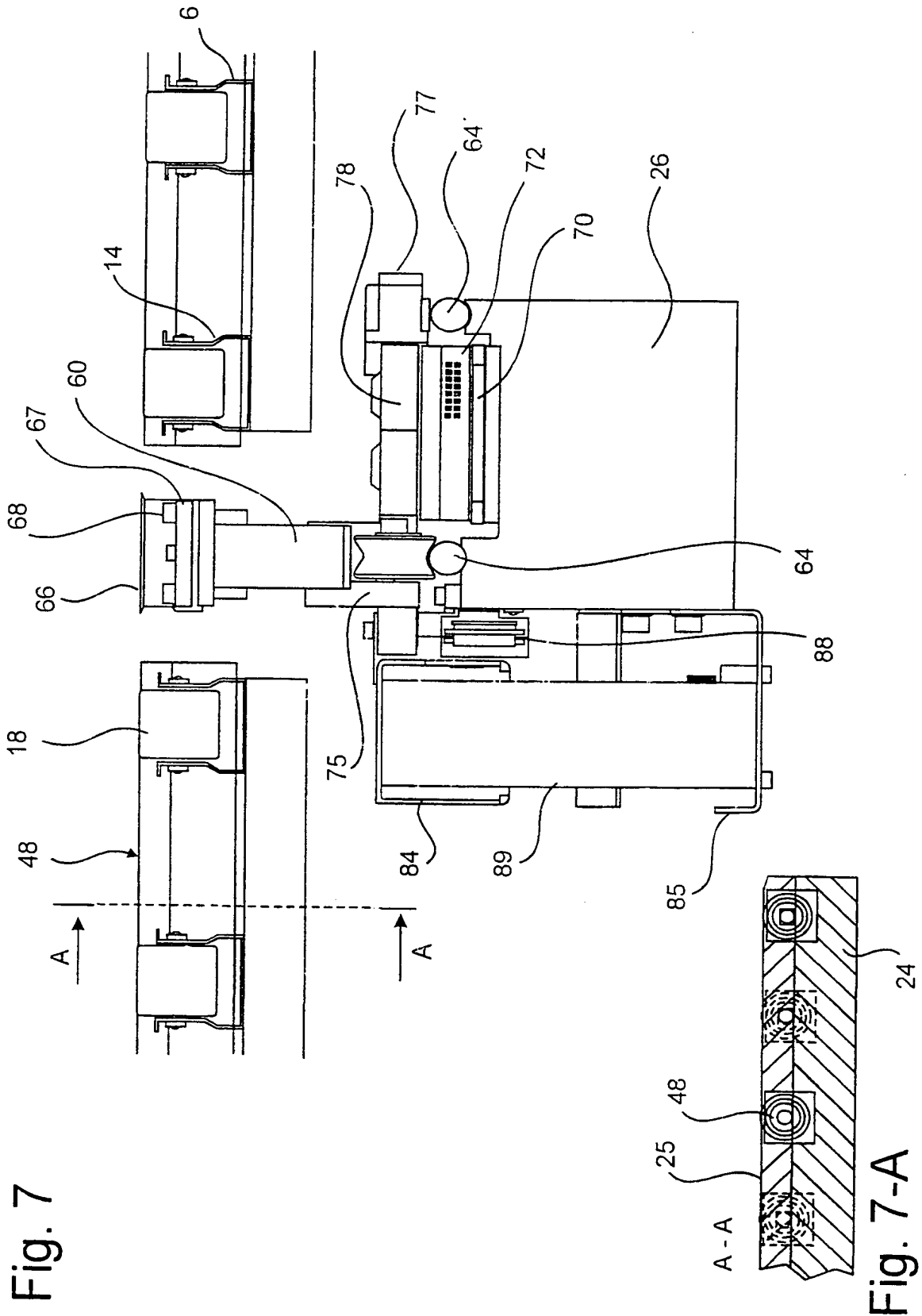


Fig. 7

Fig. 7-A

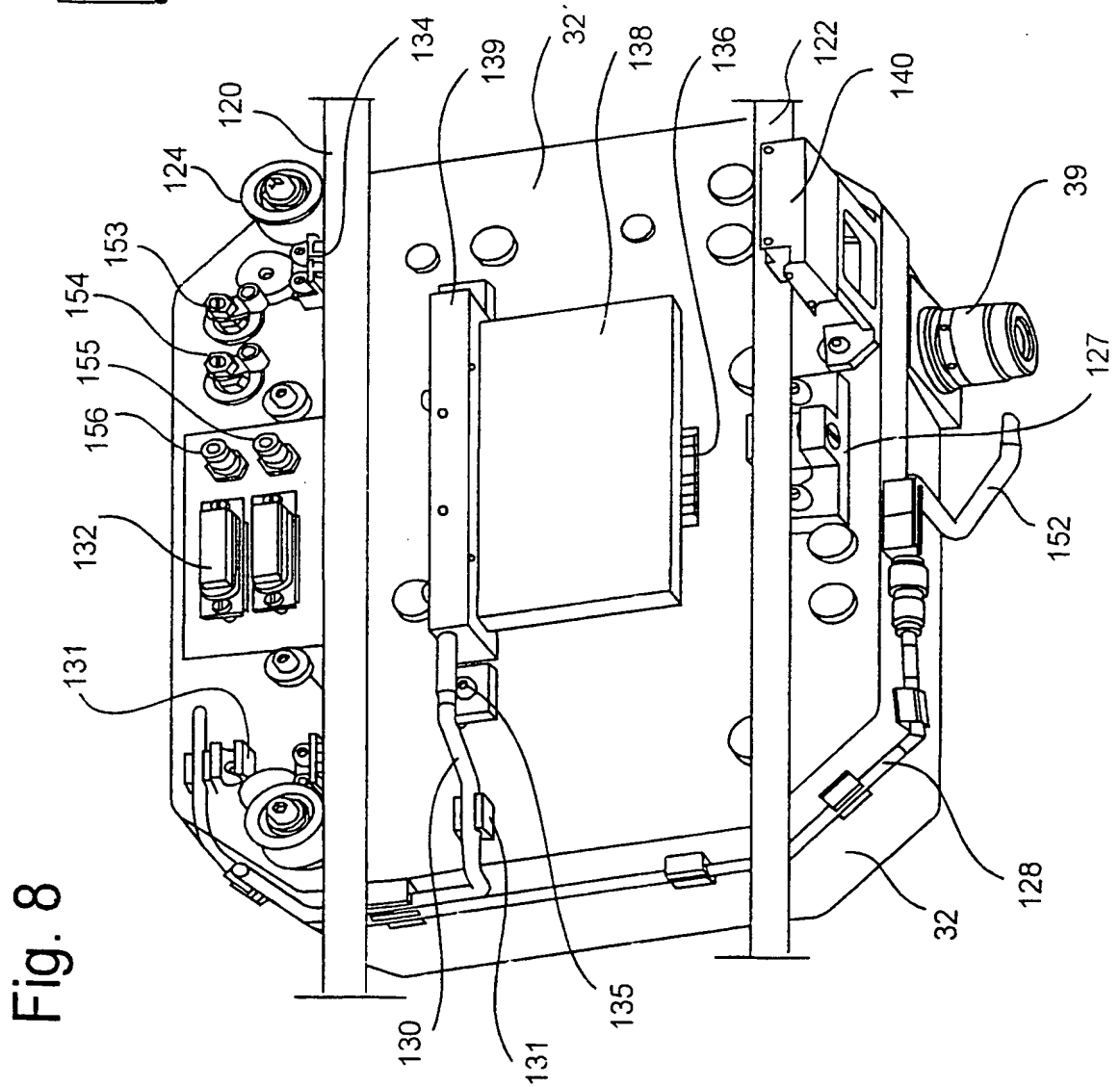
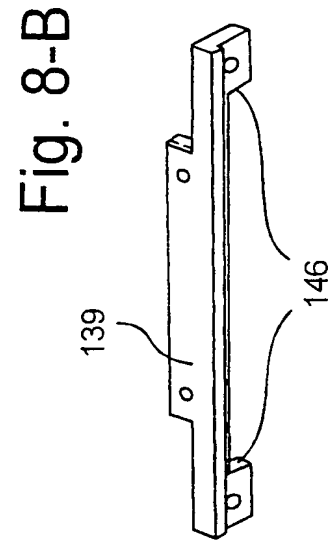
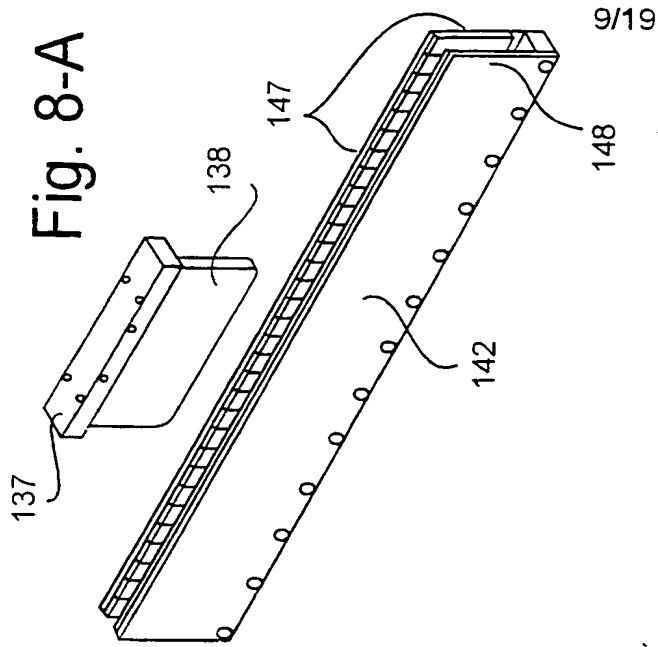
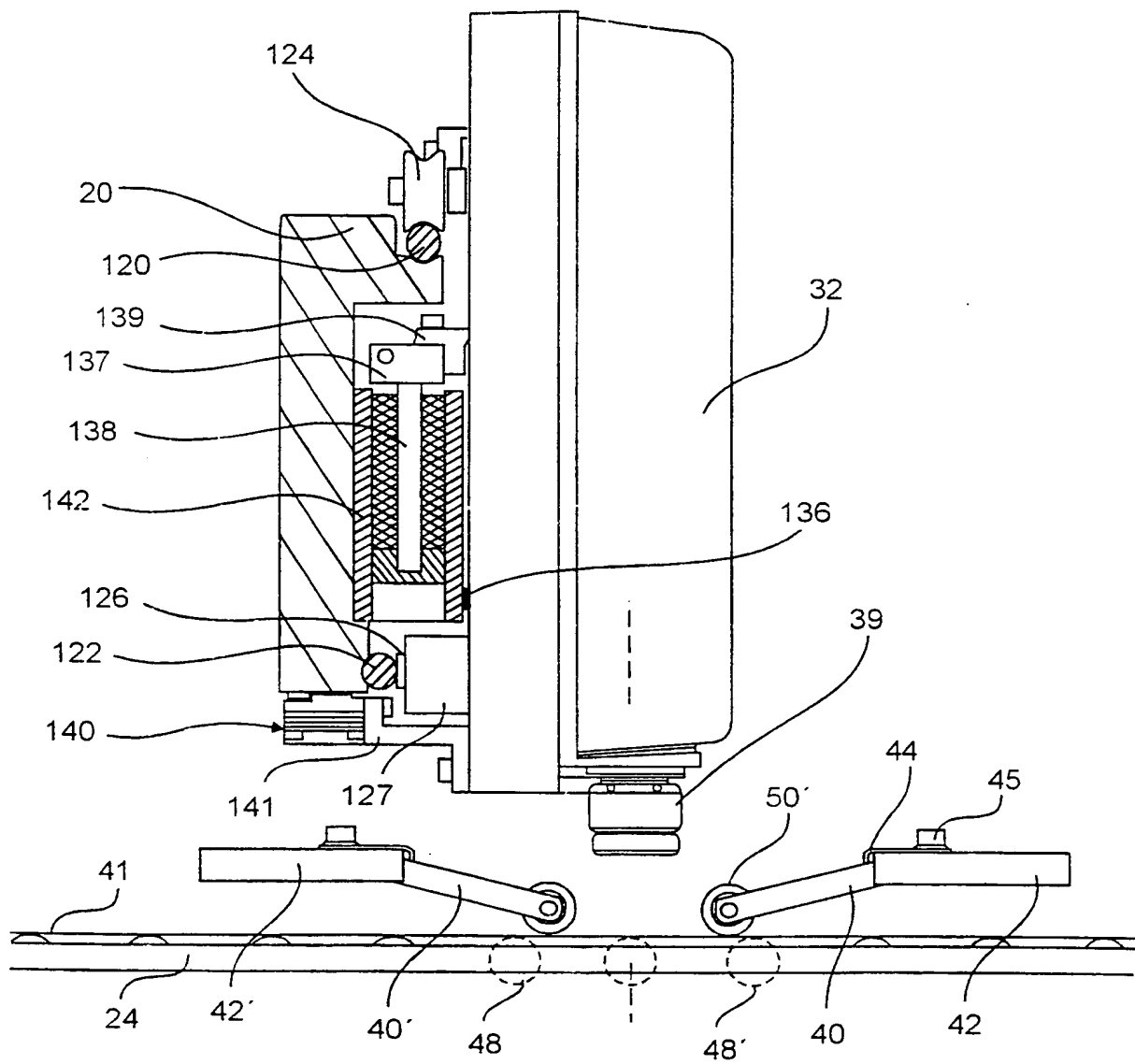


Fig. 9



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Fig. 10-A

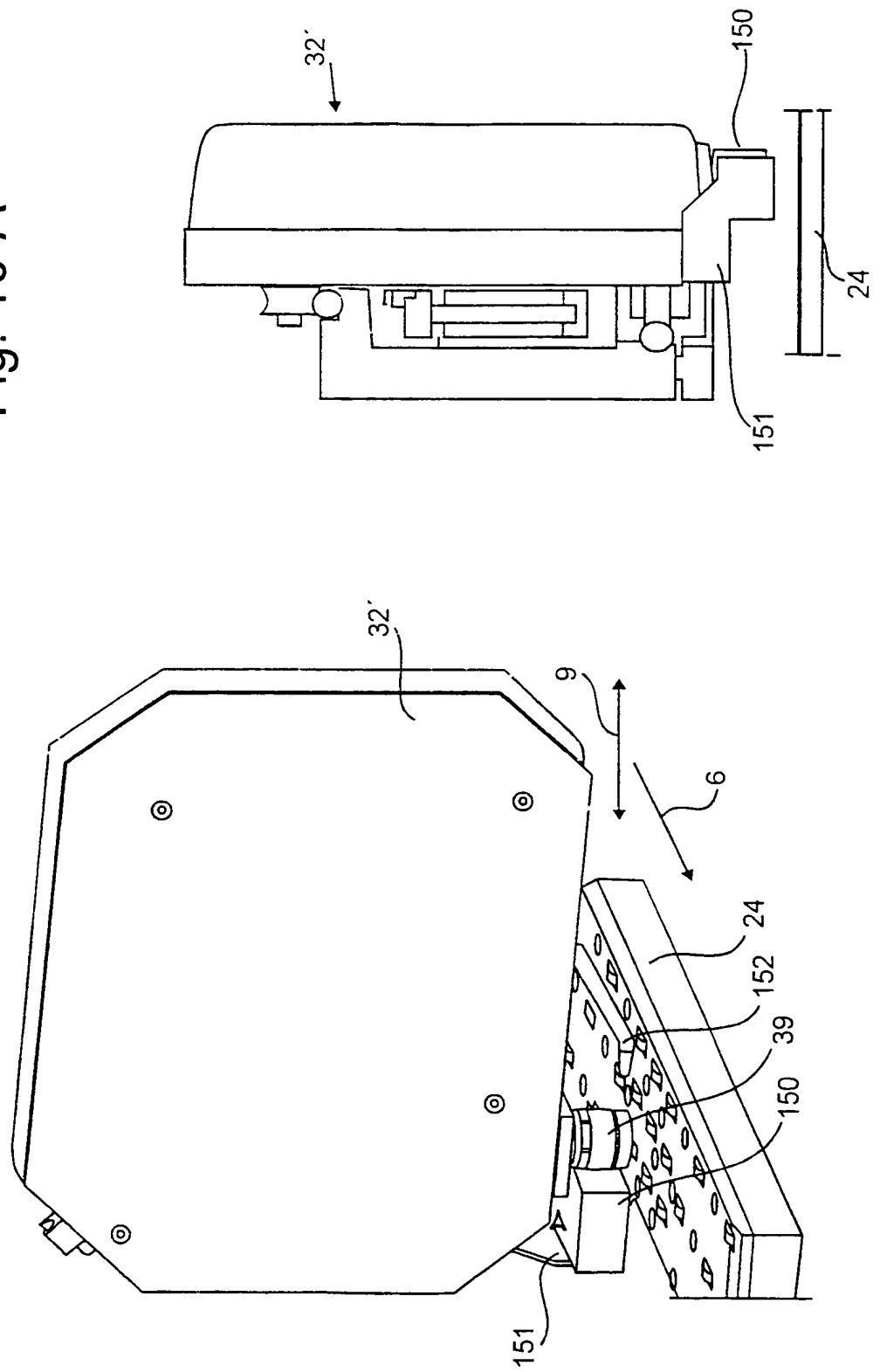


Fig. 10

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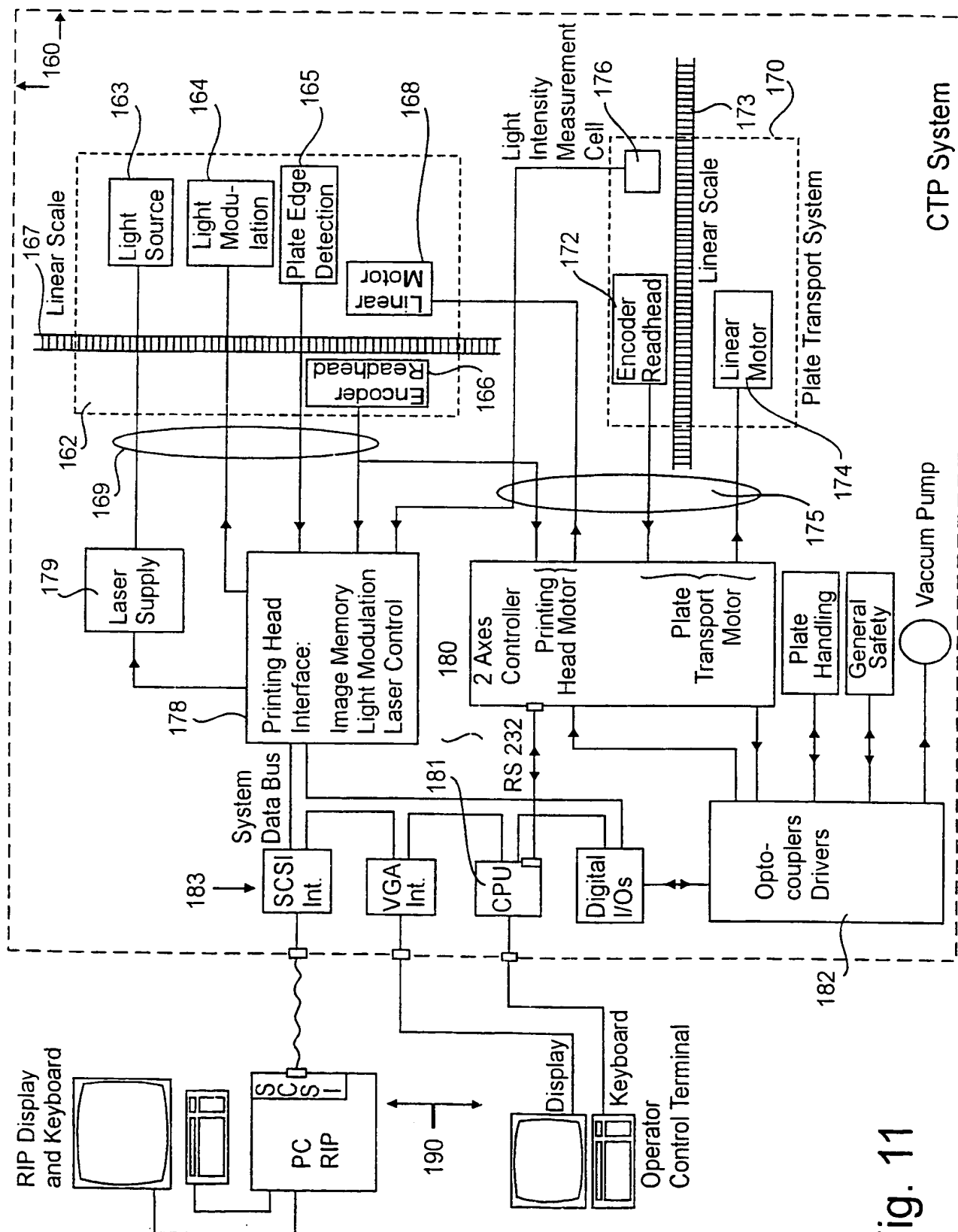


Fig. 11

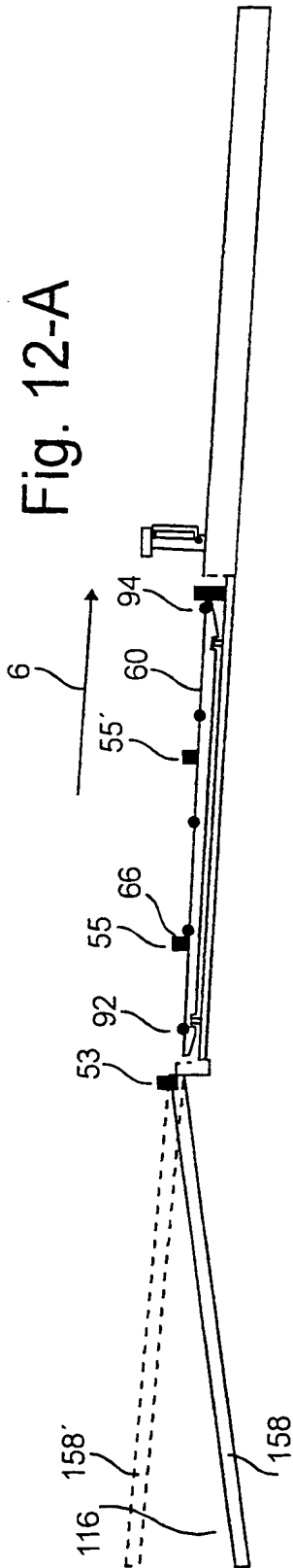


Fig. 12-B

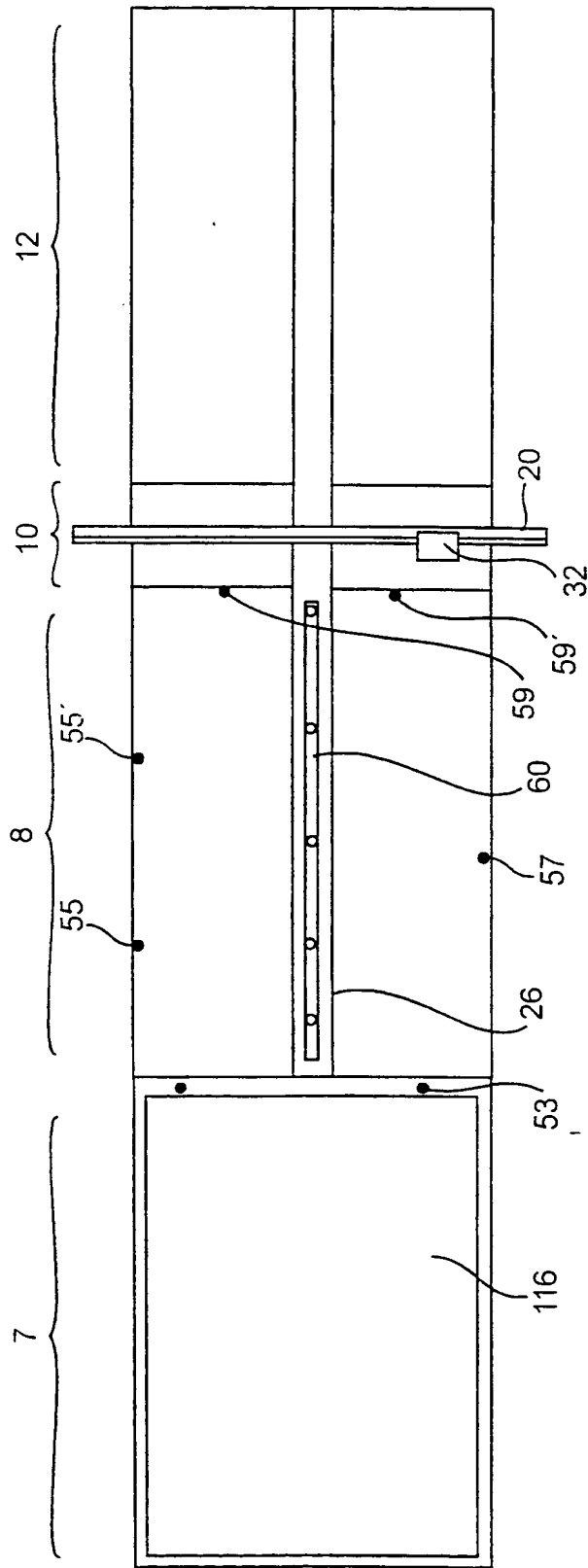


Fig. 13-A

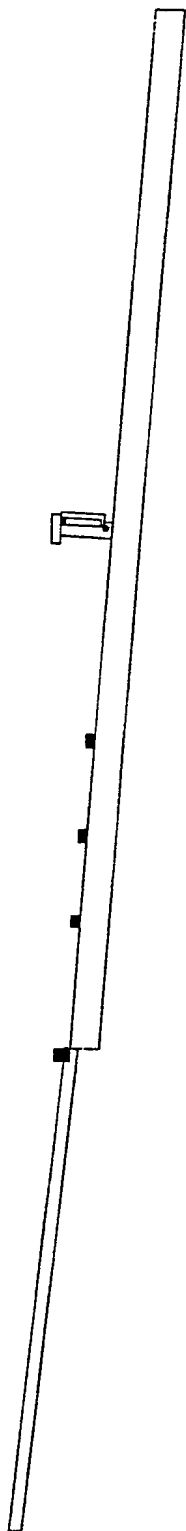


Fig. 13-B

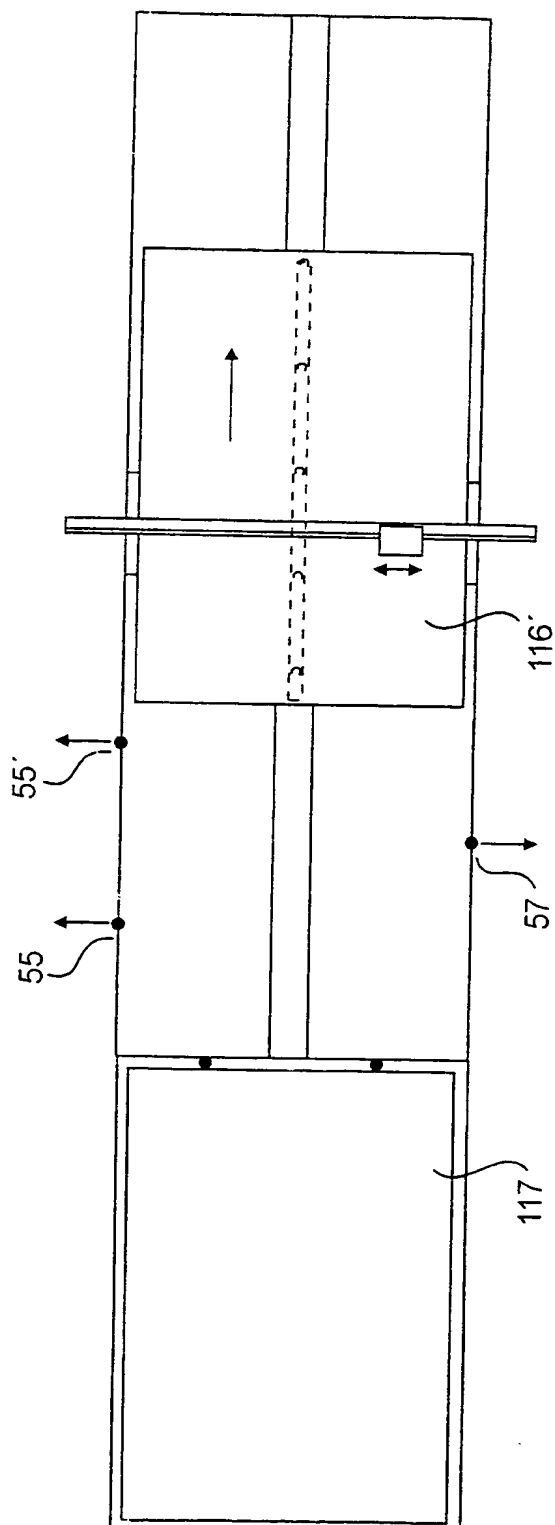


Fig. 14-A

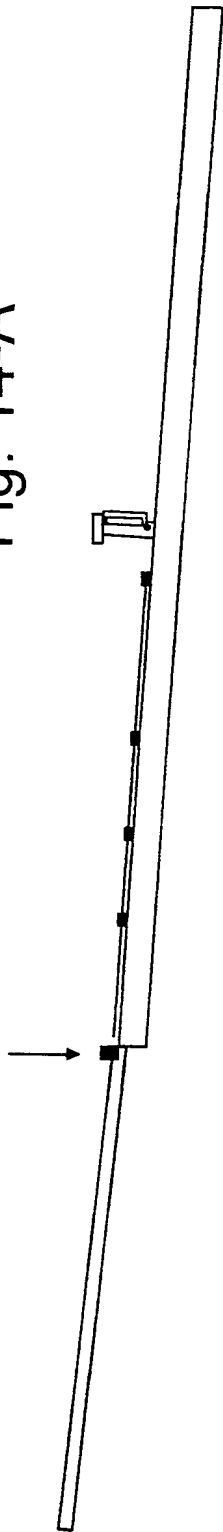


Fig. 14-B

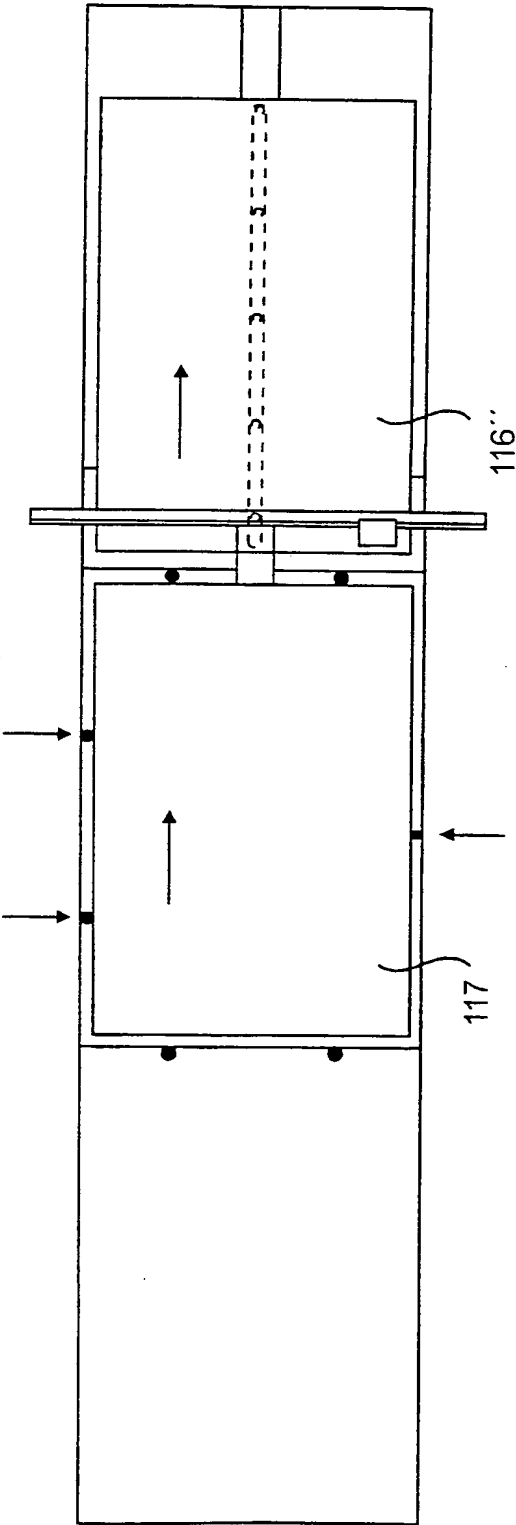


Fig. 15-A

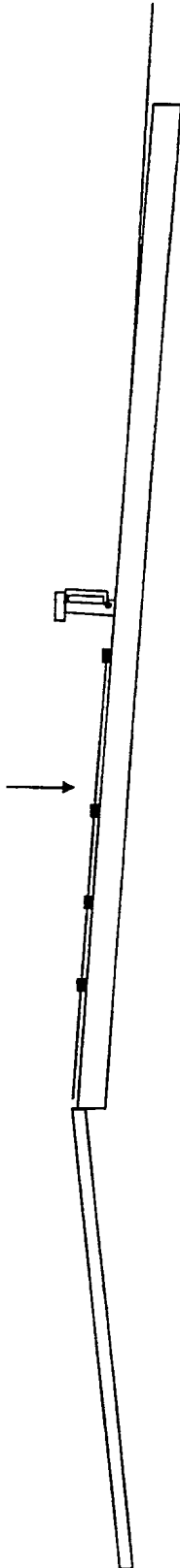


Fig. 15-B

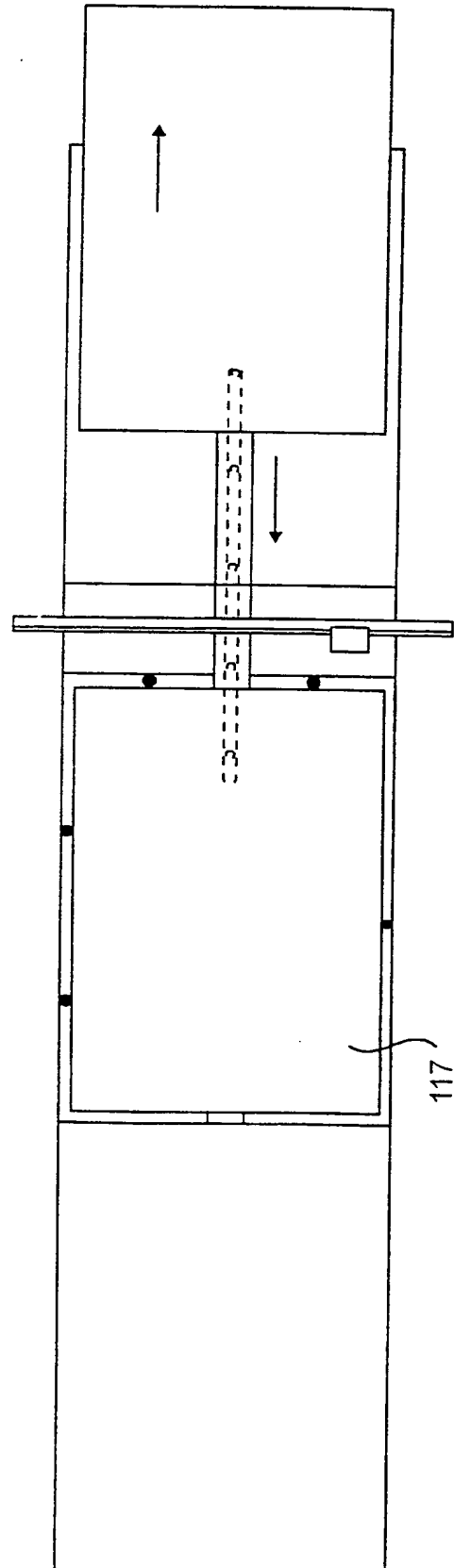


Fig. 16-A

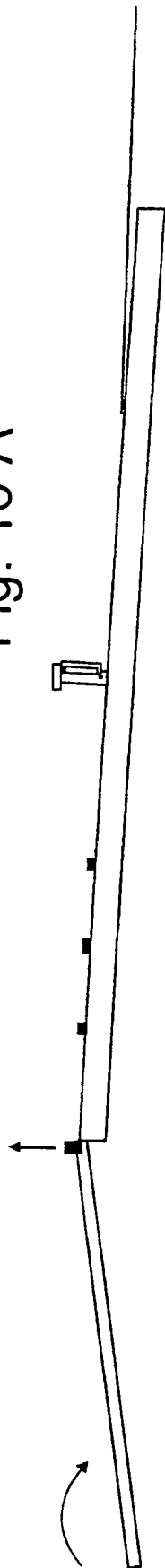


Fig. 16-B

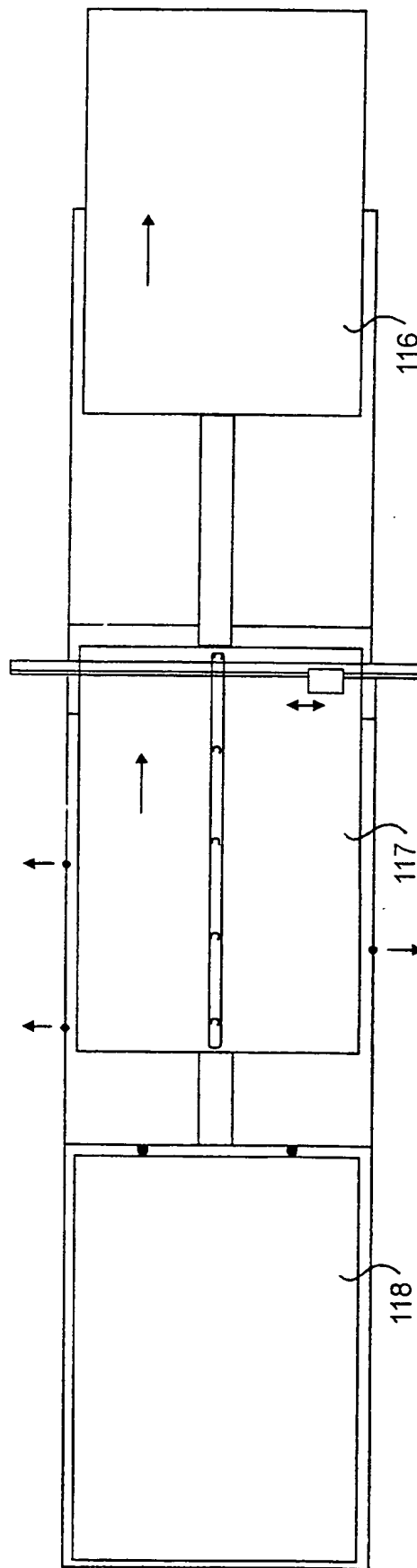


Fig. 17-A

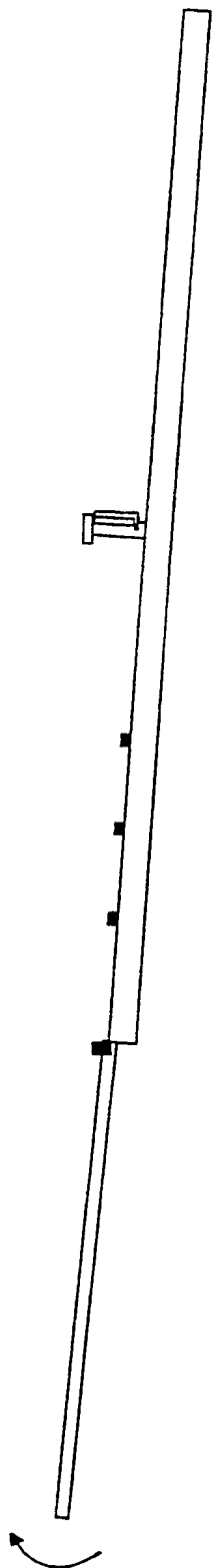
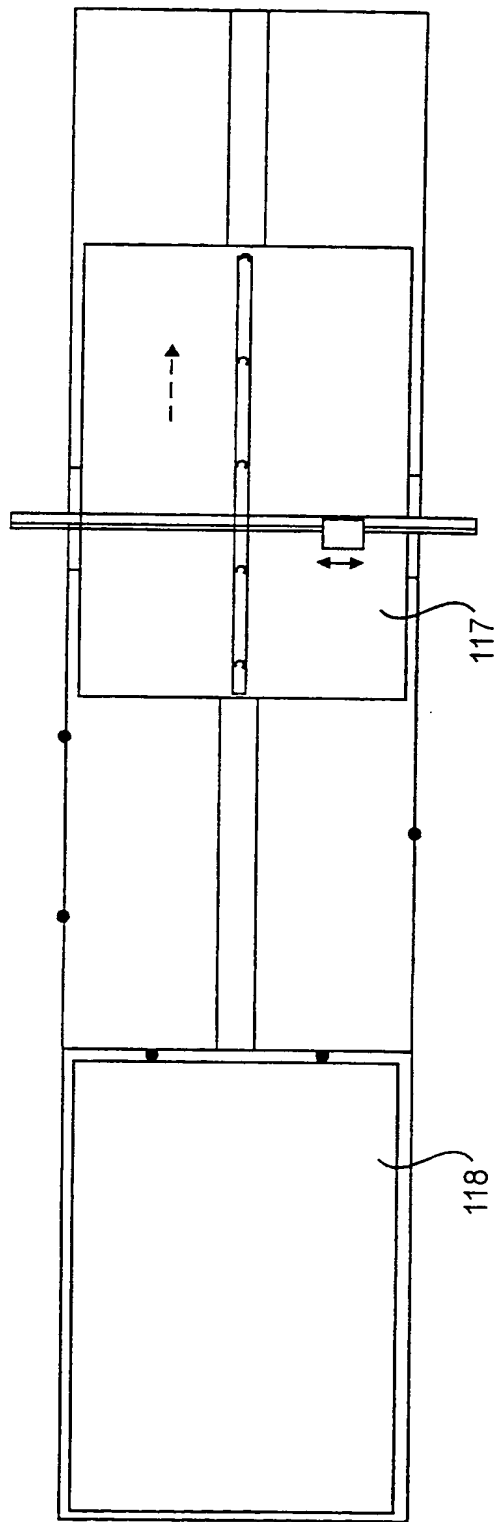
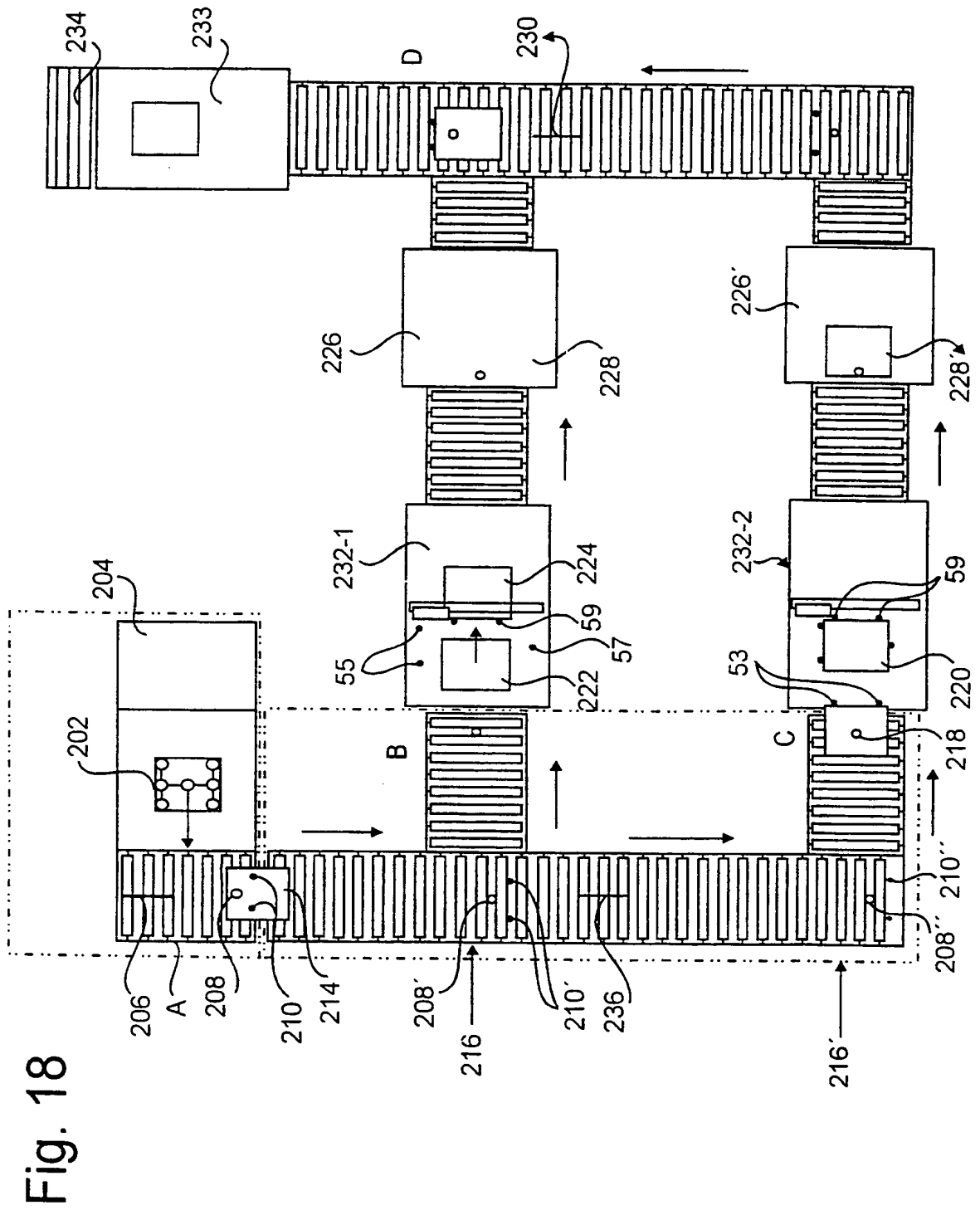


Fig. 17-B





INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 00/01302

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G03F7/20 H04N1/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G03F H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	<p>US 5 934 195 A (POWERS JOHN W ET AL) 10 August 1999 (1999-08-10)</p> <p>column 3, line 33 -column 14, line 38; figures 1,2</p> <p style="text-align: center;">--- -/-</p>	<p>1,2,4,7, 9,11-13, 16,17, 19-21, 24,28, 39,42, 43,46</p>

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Date of the actual completion of the international search

28 June 2000

Date of mailing of the international search report

05/07/2000

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INTERNATIONAL SEARCH REPORT

Inter national Application No

PCT/EP 00/01302

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	<p>US 4 417 260 A (OKAMOTO YOSHIHIKO ET AL) 22 November 1983 (1983-11-22)</p> <p>column 1, line 15 -column 3, line 53 column 4, line 48 - line 61; figures 1,3</p>	<p>3,6, 9-13,15, 16,18, 19,46</p>
A	<p>WO 97 05736 A (ELONEX PLC) 13 February 1997 (1997-02-13) page 7, line 27 -page 10, line 17</p>	<p>1-46</p>
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information on patent family members

International Application No

PCT/EP 00/01302

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